

WORK PACKAGE 3

ACTIVITY A3.3 SURVEY IN PILOT AREAS

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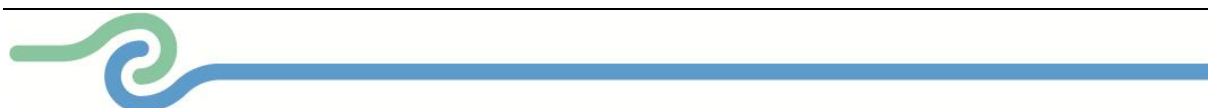
REPORTS ON OBSERVED CLIMATE CHANGE IMPACTS

NUOVA PESCARA



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1. INTRODUCTION AND TERRITORIAL FRAMEWORK

The area comprising the municipalities of Pescara, Spoltore, and Montesilvano constitutes a single urban organism representing the beating heart of the Middle Adriatic. With a total population exceeding 190,000 inhabitants (destined to be formally consolidated with the establishment of "Nuova Pescara" in 2027), the area concentrates over a third of the entire Abruzzo region's productive fabric. It is here that the main routes of commercial exchange, advanced logistics, tertiary services, and a seaside tourism sector—acting as a driver for the regional supply chain—converge.

The territory extends along a densely urbanized coastal strip (Pescara and Montesilvano) that merges seamlessly with the clay hills of Spoltore and Montesilvano Colle. This "coast-hill" configuration offers a variety of productive ecosystems—from professional fishing and aquaculture to agricultural excellence (Aprutino Pescaresse PDO)—but exposes the area to systemic vulnerability. As a central node of transport networks (Port, Airport, A14-A25 motorway junction, and the Adriatic railway line), the efficiency of this area is fundamental to the economic stability of a vast interregional basin.

A cross-analysis of environmental data defines the Pescara-Montesilvano-Spoltore area as a true "Climate Hotspot." According to the European Climate Risk Assessment published by the European Environment Agency (EEA, 2024), Mediterranean coastal areas are classified as "climate change hotspots," featuring a combined increase in marine temperatures, extreme precipitation events, and water stress. Evidence observed in the pilot area is consistent with these scenarios.

The territory's vulnerability is not accidental, but the consequence of friction between accelerated urban growth and new climate regimes. The urban configuration is marked by high soil saturation. Pescara, with over 52% of its territory cemented, holds the regional "negative record" for land consumption (ISPRA, 2025). This "asphalt cap" prevents natural drainage, transforming every intense rainfall event into a potential flood. The saturation of areas adjacent to the Pescara and Saline River basins, combined with sewage infrastructure often of the "combined" type (stormwater and wastewater together), is no longer able to withstand the impact of climate tropicalization.

Analysis of ARTA Abruzzo series (Climate Monitoring Network 1991–2024) and CETEMPS (Regional Climatological Reports - University of L'Aquila) shows an



increase in the average annual temperature of +1.4°C compared to the 1991–2020 period (ARTA Abruzzo, 2024). The 2023–2024 biennium ranks among the hottest ever recorded in the region. In parallel, a tropicalization of the rainfall regime is observed: a decrease in cumulative winter precipitation (–20/25%) and an increase in intense events exceeding 30 mm/hour, consistent with the convective intensification predicted by IPCC models (IPCC AR6, 2021).

Table 1 – Climate indicators observed in the pilot area

Indicator	Average 1991–2020	2023–2024	Variation
Mean Annual Temperature	14.8°C	16.2°C	+1.4°C
Days >35°C	6/year	18/year	+200%
Tropical Nights (>25°C)	4/year	21/year	+425%
Events >30 mm/h	2–3/year	8–10/year	+230%
Summer Mean SST	24.5°C	27.8–29°C	+3–4°C

Extreme weather events—from "water bombs" (cloudbursts/flash floods) to marine and terrestrial heatwaves—have shifted from being considered "statistical exceptions" to constant "economic variables." For businesses, for example, this means climate risk enters directly into the balance sheet in the form of rising insurance premiums, post-flood restoration costs, and revenue losses due to operational downtime. For the primary sector, it translates into mussel die-offs due to marine "thermal traps" or agricultural production failures due to the cracking of clay soils.

This Report aims to assess the main climate pressures in the Nuova Pescara Pilot Area, collecting data on floods, extreme weather events, fires, drought, water scarcity, deterioration of coastal infrastructure, and the spread of invasive species. This information will form the basis for discussion with stakeholders on possible design solutions and for the construction of Strategic Guidelines to support the governance of the vast area. The goal is to transform the emergency into a stable management model, ensuring the economic resilience of businesses and the safety of citizens in a profoundly changed climate scenario.



The Report therefore contains:

1. **Multilevel Impact Analysis:** Investigating how hydrogeological and thermal criticalities are redefining socio-economic development dynamics and the sustainability of sea and land supply chains.
2. **Identification of Intervention Gaps:** Highlighting synergies and/or discrepancies between current policies, projects, and infrastructures and the needs imposed by an increasingly warm and unpredictable Adriatic.
3. **Data Integration:** Providing a unified reading by drawing from the most authoritative sources (ARTA, ISPRA, CETEMPS, Chambers of Commerce) to overcome information fragmentation between different entities.
4. **Operational Proposals and Resilience:** Defining an adaptation roadmap that leverages the transition towards "Nuova Pescara." Proposals range from urban regeneration to the revision of risk management models.

2. MULTILEVEL IMPACT ANALYSIS

2.1. IMPACTS OBSERVED ON MARINE RESOURCES, FISHERIES, AND AQUACULTURE (BLUE ECONOMY)

The marine area between Pescara and Montesilvano represents a unique ecosystem where biological productivity is strictly linked to nutrient input from rivers. However, this balance is now compromised by unprecedented fragility that transforms natural resources into economic liabilities. This coastal area acts as the final receptor for pollutant and sedimentary loads from the Abruzzo hydrographic basin. The health of this stretch of sea depends on the encounter between marine dynamics and the inputs of the Pescara and Saline rivers. The following issues are highlighted:

- **The Plume Effect:** During intense meteorological events, the Pescara River generates a "plume" of freshwater loaded with sediments and nutrients. Under Scirocco wind conditions, this flow does not disperse offshore but is pushed North, along the coast of Montesilvano (ARTA Abruzzo – Bathing Monitoring 2010–2024).



- **Stratification and Hypoxia:** Freshwater, being lighter and warmer, floats above saltwater, creating physical stratification that prevents oxygen exchange with the seabed (Danovaro et al., 2009).
- **Infrastructure Impact:** The configuration of the new Pescara breakwater, while necessary for port safety, has altered current patterns. Hydraulic-maritime studies indicate areas of sediment stagnation to the North that tend to suffocate natural banks and coastal farming structures.

The 2024 Crisis and First Responses to the Emergency

2024 was classified by operators and ARTA monitoring as the year of total crisis, a point of no return for local mussel farming (ARTA Sea Bulletins, 2024). According to the definition by Hobday et al. (2016), these conditions fall into the category of a **Marine Heatwave**. Technical reports presented at regional tables for the recognition of the state of calamity (DGR Regione Abruzzo n. 915/2024) report:

- **Marine Heatwave:** For over two months, surface temperatures consistently exceeded 30°C. The most alarming technical datum was the absence of a thermocline: the water column was homogeneously warm (isothermal) down to 10–12 meters deep. This rendered the traditional practice of lowering the "socks" (nets) in search of cooler currents useless.
- **The Mucilage Trap:** "Marine snow," favored by high temperatures, mechanically deposited on farming structures, suffocating mollusks (*Mytilus galloprovincialis*) and preventing feeding. Mortality reached peaks of 80–100%, destroying not only the product ready for consumption but also the "seed" for the 2025 season.
- In parallel, in professional fishing, a reduction in the size of anchovies and sardines has been observed for ten years: fish reach sexual maturity but stop growing due to poor plankton quality influenced by the overly warm sea.

Table 1: Synthesis of Pilot Area Vulnerabilities

Criticality	Observed Dynamic	Impact
Plume Effect	Post-rain bacterial input	Harvesting bans (2–5 days)



Isothermal Column	Absence of thermocline down to 12m	Mortality 80–100%
Mucilage	Deposition on nets	Mollusk suffocation
Current Alteration	New breakwater	Sediment stagnation zones

The Abruzzo Region has responded to the structural crisis by investing in high-tech adaptation strategies through EMFAF (FEAMPA) funds.

- **Satellite and Hydrological Monitoring:** Thanks to data from Copernicus Sentinel-2 and Sentinel-3 satellites and CHyM hydrological models from CETEMPS, it is now possible to map sediment and pathogen dispersion in real-time.
- **Early Warning Systems:** The FORESHELL project demonstrated that within 2–5 days of a rainfall event, *E. coli* peaks transported by rivers reach the plants. The system now allows SMS alerts to be sent 48 hours in advance, allowing mussel farmers to plan harvests before the arrival of bacterial or thermal waves.
- **Moving Off-shore:** The strategy involves moving plants offshore and using submersible technologies, which are less subject to coastal thermal stagnation and sediment dispersion from rivers.

Furthermore, the real breakthrough implemented is political and managerial. With the establishment of the **Abruzzo Sustainable Blue Deal** table, a common platform has been activated: for the first time, ARTA, the Zooprophyllactic Institute (IZSAM), the Local Health Authority (ASL), and the University share data on a single platform. The goal is to transform the emergency into a stable management model, ensuring the economic resilience of businesses (through new insurance instruments for calamities) and maximum food safety for the final consumer.

Table 2: Pillars of Technological Innovation

Project / Tool	Technology Used	Benefit for Operator
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Copernicus Sentinel-2	High-resolution satellite images.	Real-time mapping of sediment dispersion.
AZA Planning	Maritime spatial zoning.	Moving plants offshore.
Predictive Systems	CHyM hydrological models.	Reduction of sanitary downtime and prevention of die-offs.

Table 3: Strategic Objectives of the Blue Deal

Objective	Practical Action
Stable Collaboration	Overcoming data fragmentation between different entities.
Economic Resilience	Creating insurance and support tools for extreme events.
Off-shore Sustainability	Incentivizing the transition to deeper and more dynamic waters.
Consumer Protection	Ensuring food safety even in changed climate scenarios.

Sources

In detail, the reasoned “bibliography” of specific information on Pescara–Montesilvano:

On River Dynamics and Pollution (Pescara vs. Vibrata)

- Source: Studies by CETEMPS (Centre of Excellence of the University of L’Aquila) and IZSAM.
- Reference: The FORESHELL project is based on hydrological models (CHyM) that CETEMPS has been applying for years also to the Pescara river basin. Publications related to the CapRadNet project and historical ARTA monitoring of bathing waters scientifically document the behavior of the Pescara River “plume” and its stagnation northward (toward Montesilvano) under Scirocco wind conditions.

On the Opening of the Breakwater and Sediments



- Source: Interregional Public Works Authority and Port System Authority.
- Reference: The final designs for the “Cutting of the Breakwater” and the new PRP (Port Master Plan) of Pescara contain hydraulic-maritime studies that predict exactly how sediment flow will change. The information that sediments will move further offshore is the technical basis that justified the multi-million-euro investment in the project, with the aim of “cleaning” nearshore waters.

On the 2024 Die-Off and “Deep” Temperatures

- Source: ARTA Abruzzo data (Regional Network) and Trade Associations (e.g., press releases from Federpesca, Legacoop Agroalimentare).
- Reference: Surface temperatures (30°C) are satellite data (Copernicus). The detail regarding temperature at 5–8 meters depth and the absence of a thermocline comes from technical reports that operators (mussel farmers) submit to regional technical committees to request a State of Emergency (Regional Government Resolution 915/2024). When farmers say, “we lowered the ropes but they died anyway,” they are precisely describing the physical phenomenon of an isothermal water column.

On the “Nuova Pescara” and Unified Management

- Source: Regional Law establishing Nuova Pescara and local administrative reporting.
- Reference: The merger of the municipalities is a public and well-known administrative process. The deduction regarding the unification of state property offices is a direct and technical consequence of the merger: there will no longer be a Montesilvano state property office separate from that of Pescara, which will impact aquaculture concessions.

On the Montesilvano Barriers and Mucilage

- Source: Coastal defense studies (e.g., the RICAMA Project of the Abruzzo Region) and empirical observations in 2024.
- Reference: The issue of parallel breakwaters reducing water exchange is a classic topic in Adriatic coastal engineering. The aggravating factor of mucilage in 2024 in these “closed” areas was widely discussed in local news reports (e.g., Il Centro, Rete8) during the summer, with complaints from beach operators and clam fishers about water that “was not circulating.”

2.2. IMPACTS ON AGRICULTURE AND WATER RESOURCES (GREEN ECONOMY)

The Nuova Pescara area represents a unique ecosystem where coastal urbanization merges with the clay hills of Spoltore and Montesilvano Colle. This territory, historically suited for viticulture, olive growing (Aprutino Pescara PDO), and high-quality horticulture, is today in the eye of the storm of climate change. The transition from a temperate climate to a “tropicalized” regime has made old management systems



obsolete. The area is facing the most severe water crisis of the last 30 years, characterized by a change in the rainfall regime:

- **Meteorological Drought:** The main problem reported by farmers is the absence of consistent rainfall in winter. Without rain or snow in the cold months, the soil does not accumulate the deep "water reserve" necessary for spring vegetative resumption.
- **Precipitation Extremes:** When it rains, water manifests in short and extremely violent events that the parched soil cannot absorb, transforming a resource into a factor of erosion and instability.

The hills of Spoltore and Montesilvano Colle are characterized by predominantly clay-silt soils, whose response to heat stress exacerbates the productive crisis:

- **The "Cracking" Phenomenon:** When clay dries out too much, it shrinks, creating deep cracks that descend into the subsoil. These fractures mechanically break the root capillaries of crops (wheat, vegetables, and young vines), interrupting plant nourishment regardless of the presence of surface water.
- **Impermeabilization:** During summer thunderstorms, soil hardened by heat acts like cement. Water slides away quickly or channels into cracks without hydrating the root mass.
- **Hydrological Drought and Saline Wells:** The lowering of fresh groundwater tables draws salt water from the sea. In the piedmont zone, many farmers have had to abandon historical wells because the extracted water presented electrical conductivity (salinity) levels toxic to plants.

2024 Damage Assessment and Ongoing Responses

Official data presented at the Regione Abruzzo "green table" outline a devastating picture for the Pescara area. The 2024 vintage was classified as one of the most critical in the last thirty years for agricultural yields in the metropolitan area (Coldiretti-Drought Report 2024; Confagricoltura Production Trend Dossier 2024).

- **Viticulture (Spoltore/Pianella/Città Sant'Angelo Area):** After damage from Downy Mildew in 2023 (caused by excess rain), the 2024 drought further reduced volumes. Grape production is estimated to drop by 30% to 40%



compared to the average, with reduced berry sizes and water stress blocking phenolic maturation.

- **Olive Growing (Aprutino Pescarese PDO):** Official estimates for the 2024/2025 campaign indicate a production collapse exceeding 50% in the Pescara hills. In addition to drought, high autumn temperatures favored olive fruit fly attacks at altitudes where they previously did not survive.
- **Haymaking and Cereals:** The hay cut (fundamental for local livestock) collapsed by 60% (only one cut was made instead of two or three). This forced livestock farms to purchase fodder from outside the region at tripled costs.

Table 4: Damage Balance by Sector (Official Sources/Agrarian Estimates)

Sector	Percentage 2024 (estimate or data)	Source
White Wine (Abruzzo)	-30%	Coldiretti Abruzzo
Olive Oil (Italy, 2024)	-32%	Coldiretti / Unaprol / Ismea
National Ag. Production (2023)	-1.8%	ISTAT
Wine (Italy, 2023)	-17.4%	ISTAT

To respond to the crisis, entities such as ACA Spa and the Centro Reclamation Consortium have activated strategic interventions funded by the PNRR (National Recovery and Resilience Plan), regional funds, and the Extraordinary Commissioner for Drought.

- **"Flagship Project" (Wastewater Reuse):** Recovery of water leaving the Montesilvano purifier. Instead of discharging into the Saline River, 100–150 l/s of water will be chemically refined for irrigation and industrial use. Investment: €3.9 million.
- **ACA Digitization (PNRR):** A €16.3 million plan for the districtualization of the Pescara and Spoltore networks. Includes the installation of Smart Metering and Noise Loggers (underground acoustic sensors to identify hidden leaks before pipe rupture).



- **Reclamation Consortium Network Modernization:** Projects to pipe old open-air canals of the "Destra Pescara" (Spoltore/Villanova) for €6.1 million, eliminating evaporation and illegal withdrawals. Funded by ERDF 2021-2027 and ministerial funds, specifically regarding:
 - *Reservoir Safety (Project Financing):* Tender underway (expiring 2025) for securing and efficiency upgrades of consortium storage tanks. Cleaning and waterproofing them allows for the storage of winter rainwater for July use.
 - *Modernization of "Right and Left Pescara" Networks:* Specific projects to pipe open canals in the agricultural plain between Spoltore and Cepagatti.
- **Emergency Measures:** Upgrading the Tirino (Bussi) potabilizer as a "reserve lung" and activating interconnections (bypass) to move water towards the high areas of Spoltore.

In addition to public interventions, funds have been made available to transform private farms into technologically advanced units.

- *Accompanying Measures:* Direct Compensation (MASAF Decree) for losses exceeding 30%; Company Innovation (Call SRD01) for underground drip systems and weather stations; Water Autonomy (Call SRD08) for creating micro-reservoirs.
- *Experimental Projects:* Coldiretti & Filiera Italia supply chain agreements rewarding lower water use (e.g., soil moisture probes for tomatoes); Wastewater Reuse from Montesilvano dedicated primarily to coastal agriculture.

Table 5: Infrastructure and Strategic Sites

Intervention Scope	Specific Project	Investment	Expected Benefit
Water Efficiency	Piping "Destra Pescara" canals	€ 6.1 mln	Elimination of evaporation losses and theft.



Circular Economy	Montesilvano Wastewater Reuse	€ 3.9 mln	150 l/s of "new" water for coastal agriculture.
Digitization	Smart Metering & Noise Loggers	€ 16.3 mln	Instant detection of hidden network leaks.
Storage	Safety of compensation tanks	€ 0.8 mln	Increased reserve capacity for July/August.
Emergency Response	Colle Renazzo extraordinary maintenance	-	Network restoration for peri-urban horticultural firms.

Sources

Hydrogeological and Climate Data (Institutional Bodies)

- o **ISPRA (Higher Institute for Environmental Protection and Research):** The annual reports on Hydrogeological Instability in Italy provide hazard maps for landslides and erosion. The area of Spoltore and Montesilvano Colle is well known in these maps for the presence of clay soils and landslide risk (P3/P4 areas).
- o **Abruzzo Region – Regional Strategy for Climate Change Adaptation (SRACC):** Official regional documents analyzing temperature and precipitation trends specific to the coastal and hilly areas of Abruzzo.
- o **CETEMPS (L'Aquila):** The Centre of Excellence of the University of L'Aquila publishes meteorological and hydrological reports confirming "tropicalization" trends (cloudbursts and prolonged drought) in Abruzzo.

Agricultural Reports and Trade Associations

- o **Coldiretti Abruzzo and CIA (Italian Farmers' Confederation):** I drew from the periodic communications and annual reports these associations release regarding agricultural seasons. They consistently report the decline in olive oil production due to the olive fruit fly and damage to vineyards caused by late frosts in the province of Pescara.
- o **Consortium for the Protection of Abruzzo Wines & DOP Aprutino Pescara:** Technical bulletins and amendments to production regulations often reflect the need to adapt to climate conditions (e.g., earlier harvests, management of supplemental irrigation).

Scientific Literature and Local Studies

- o **Studies on Saltwater Intrusion:** There are academic publications (often linked to the Departments of Geology or Engineering of the University G. d'Annunzio of Chieti-



Pescara) that monitor groundwater quality in the alluvial plain of the Pescara and Saline rivers, documenting the advance of the salt wedge.

o **Local Geomorphology:** The clay composition and the presence of badlands (calanchi) between Spoltore and Montesilvano are standard geological data (available in the Geological Maps of Italy produced by the Geological Service).

Local News and Historical Data

o **Local news outlets (Il Centro, Rete8):** The frequency of reports concerning landslides on provincial roads connecting Pescara to the hills, or flooding in the lower area of Montesilvano, provides empirical evidence of the impact of “cloudbursts” on a fragile territory.

o **Historical notes:** On agricultural production.

o **ACA S.p.A.:** Press Releases and Public Notices “Water Emergency 2024” (available on the official website aca.pescara.it, Notices section).

o **ERSI Abruzzo (Regional Water Service Authority):** Technical reports on the state of water resources in 2024.

Agricultural Data and Funding:

o **Abruzzo Region – Department of Agriculture:** Regional Government Resolutions (DGR) concerning the request for a state of emergency due to drought and Decrees activating FIRA loans.

o **Official Gazette:** Decree-Law 15 May 2024, No. 63 (Urgent measures for agricultural enterprises, including funds for downy mildew and climate crisis).

o **Confagricoltura and Coldiretti Abruzzo:** Dossier “Drought Damage 2024” submitted to the Abruzzo Region (September 2024).

Local Administrative Acts:

o **Municipality of Montesilvano / Municipality of Spoltore:** Mayoral Ordinances “Restriction on the Use of Drinking Water” (available in the online Official Notice Boards for the summer months of 2024).

2.3. TOURISM AND THE BEACH SYSTEM

Abruzzo's coastal tourism operates as a true “factory” where the sea and the beach are essential raw materials. If the natural system exceeds critical thermal thresholds or sewage infrastructure fails, the entire economic sector immediately goes into crisis. Analysis of indicators highlights emerging phenomena compromising the Riviera's appeal.

- **Marine Overheating (SST):** In the last two years, Sea Surface Temperature has consistently exceeded 28–30°C. “Soup-like” water reduces bather comfort and alters biological cycles.



- **The Mucilage Trap:** Viscous organic blooms are favored by high temperatures and parallel breakwaters. These barriers, created to defend the coast, reduce water recirculation, trapping mucilage ("sea snow") near the shore. The result is severe reputational damage and physical discomfort for tourists, with a collapse in "weekend commuters."
- **Tropical Nights:** With minimum night-time temperatures exceeding 25°C, there is a surge in energy costs for hotels and a forced shift of tourist life towards evening hours.

Table 6: Climate Indicators and Emerging Phenomena (2023-2024)

Phenomenon	Technical Data (ARTA/CETEMPS)	Immediate Tourism Impact
Marine Overheating	SST > 28-30°C	"Soup" water, proliferation of mucilage/algae.
Mucilage (Summer 2024)	Viscous accumulations favored by cliffs	Reputational damage; physical discomfort; fewer weekenders.
Tropical Nights	Min. night temps > 25°C	Increased energy costs; tourist life shifts to evening.
Cloudbursts	Explosive rainfall (>30mm in 1h)	Structural flooding; overflow activation; debris on beach.

Rising temperatures also result in extreme precipitation events >30 mm/h ("Water Bombs/Cloudbursts") (Arpa Abruzzo). The interaction between this extreme event and a "combined" sewer system represents the highest risk for season continuity. Cloudbursts cause the treatment plant and sewer networks to overpressurize. To avoid backflow into homes, flood spillways (like the notorious DK15) activate, discharging mixed water (rain + untreated sewage) directly into the Pescara River or the sea. Within 24–48 hours, ARTA detects exceedances of *E. coli* and Enterococci. A bathing ban ordinance is triggered. If the storm occurs on a Friday, the ban destroys weekend revenue even if the sun returns. Pescara struggles annually to maintain the **Blue Flag**, which requires "Excellent" water quality.



Climate change is also altering the tourist face of the Adriatic Riviera. While heat was historically the main attraction, today it is becoming a deterrent. Beaches tend to empty between 11:00 and 17:00; tourists seek refuge in air-conditioned environments, drastically reducing spending at beach establishments. Another alarm signal comes from the sea: mucilage in summer 2024 generated immediate image damage, leading to cancellations.

Table 7. The "Rain-Ban" Damage Chain

Phase	Technical Mechanism	Economic/Operational Impact
Weather Event	Intense rain inland or on coast.	Flooding of kitchens/warehouses (street side).
Overflow	Network overpressure & spillway opening.	Discharge of mixed water into river/sea.
Pollution	Exceeding <i>E. coli</i> parameters.	Bathing ban ordinance (24-48h). Loss of thousands €/weekend.
Visual Effect	Pescara and Saline river floods.	Brown plume and river debris; tourists refuse to swim.

Differentiated Territorial Vulnerability Analysis

Despite their urban continuity, Pescara and Montesilvano suffer from different morphological and hydraulic criticalities. Flooding is not merely a problem of urban traffic; it represents the most immediate risk factor for the bathing season in the Pescara-Montesilvano area. Below are specific findings and the mechanisms by which this phenomenon economically and operationally impacts the season, based on events from 2023-2024 and the city's hydraulic configuration.

Table 8. Differentiated Territorial Vulnerability

Area	Prevalent Criticality	Effect on Tourism Target
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Montesilvano North	Coastal Erosion	Reduction of the sandy shore for large hotels; annual sand replenishment costs.
Pescara Central/North	River Discharges/Spillways	Family/children target discouraged by recurring swimming bans.
Pescara South	Silting/Erosion	Reduction of useful space for beach umbrellas; proximity to the port-canal (turbidity).
Metropolitan Area	Urban Heat Island	Desertification of beaches during central hours (12:00 PM – 4:30 PM).

Climate change is forcing a restructuring of tourism business balance sheets, marked by a decline in daytime revenues and an increase in fixed costs. The Table below reports estimates from trade associations regarding the year 2024.

Table 9. Summary of Economic Data (Trade Association Estimates)

Budget Item	Variation	Description of the Phenomenon
Daytime Turnover	-15/20%	Drop in bar/restaurant consumption during hot hours due to escape from extreme heat.
Energy Costs	+20%	24/7 hotel air conditioning and management of the food cold chain.
Last Minute Bookings	-60% (during alerts)	Immediate cancellations as soon as weather sites signal instability.
Management Costs	Increasing	Extraordinary post-rain cleaning and removal of mucilage/algae.



De-seasonalization represents one of the main strategic challenges for the Pescara–Montesilvano area. Climate change is progressively extending the potential duration of the bathing season, but this “new summer window” is not yet being exploited due to organizational, contractual, and infrastructural limits. June is becoming increasingly unstable, with hailstorms and abrupt temperature changes compromising the start of the tourist season. Conversely, September and part of October now present typically summer conditions, with marine and atmospheric temperatures favorable for swimming.

However, school closures, the reduction of public transport, the termination of seasonal contracts, and the traditional organization of services determine an early closure of the tourism system precisely when climatic conditions would be optimal. This rigidity generates a loss of economic opportunity: operators fail to compensate for the losses of the central months—due to extreme heatwaves, mucilage, or temporary swimming bans—with the potential of September. The result is a progressive imbalance in seasonal profitability.

To maintain competitiveness against other Adriatic destinations, the Pescara–Montesilvano area must evolve towards infrastructural and managerial resilience articulated along four integrated guidelines.

The first concerns **water infrastructure**. The completion of first-flush rainwater tanks and the upgrading of the purification plant are not merely environmental interventions, but strategic economic measures, as they are functional to the reduction of swimming bans and the safeguarding of the Blue Flag recognition.

The second guideline concerns the **diversification of beach services**. Investing in swimming pools, shaded areas, and air-conditioned spaces within beach establishments would allow for the mitigation of the impact of days with unswimmable seas or excessive heat, reducing exclusive dependence on the immediate quality of the waters.

The third dimension is **risk management**. The adoption of specific insurance policies for extreme weather events, together with early warning systems for the protection of beach-side structures, would allow for greater financial stability in an increasingly variable climatic context.



Finally, a **rethinking of the seasonal employment model** is necessary, with the revision of contracts to cover the actual prolongation of the season until October, transforming the “new climatic summer” into a “new economic summer.”

This analysis is based on the integration of official public data, sector reports, and local administrative documentation regarding the 2023–2024 biennium, processed systematically to highlight the interconnections between climate, infrastructure, and economic organization.

Sources

Data on Bathability and Weather (Scientific and Institutional Sources)

- **Ministry of Health Water Portal:** This is the official source for swimming bans. Crossing the dates of “water bombs” (cloudbursts) in Pescara with the dates of (temporary) ban ordinances for sampling points “Via Balilla,” “Via Mazzini,” or “Montesilvano-Foce Saline,” a direct correlation emerges: Rain -> Ban -> Tourist Damage.
- **ARTA Abruzzo:** Monthly bulletins on water quality and, specifically, special monitoring of *Ostreopsis ovata* (toxic algae) and mucilage (summer 2024) provide the technical basis for the visual/olfactory problem.
- **CETEMPS (Univ. L'Aquila):** Publishes monthly climatological reports for the Abruzzo Region. Data on “tropical nights” (minimums >20/25°C) and thermal anomalies that make central hours in the city unlivable come from here.

Economic Data and Attendance (Trade Associations)

Percentage data (drop in turnover, cancellations, energy costs) come from press releases and periodic reports of the main associations operating on the Pescara coast:

- **SIB (Italian Union of Beach Operators) and FIB (Italian Federation of Beach Operators) Abruzzo:** During summer 2024, they released several statements (covered by *Il Centro* and *Rete8*) quantifying the drop in daytime consumption due to excessive heat and refund requests for mucilage.
- **Federalberghi Pescara:** Primary source for data on bookings, “last minute” trends, and the shortening of the booking window (due to weather uncertainty).
- **CNA Balneatori:** They often publish dossiers on coastal erosion (“Erosion and Tourism” project), estimating the meters of beach lost in Montesilvano and the seasonal sand replenishment costs borne by concessionaires.

Infrastructural and Administrative Data

- **Municipality of Pescara and ACA (Azienda Comprensoriale Acquedottistica):** News on work at the purification plant, first-flush tanks, and spillways (DK15) are public acts. Overflow problems during thunderstorms are documented in technical reports regarding the management of the Blue Flag (or its temporary revocation).



- **Legambiente ("Mare Monstrum" and "Goletta Verde" Dossiers):** Although partisan, they provide precise data on illegal or malfunctioning discharges along the Pescara River and the Saline, which directly impact tourist perception.

Local Chronicle

Many dynamics (such as the shift of tourist life to the evening or complaints about mucilage trapped by cliffs) are news facts reported daily by local media (*Il Pescara*, *AbruzzoWeb*, *Il Messaggero Abruzzo*) during the 2024 summer season.

Institutional Sources and Official Data (Bathability and Bans)

These are the "primary" sources that certify the link between rain and bans.

- **Ministry of Health Water Portal (www.portaleacqua.salute.gov.it)**
 - *What to search:* Select "Abruzzo" -> "Pescara" or "Montesilvano".
 - *The finding:* Clicking on individual sampling points (e.g., "Area opposite Via Mazzini" or "100m South of Saline River Mouth"), you can see the history of analyses. You will find that *Escherichia coli* values skyrocket above limits (500 MPN/100ml) almost always on dates following recorded heavy rainfall events.
- **Official Notice Board (Albo Pretorio) of the Municipality of Pescara and Municipality of Montesilvano**
 - *Documents:* Mayoral Ordinances for swimming bans.
 - *The finding:* Search for ordinances issued "as a precautionary measure" or "following ARTA note." Often the text of the ordinance explicitly reads: "Given the meteorological event of day X and the opening of the spillway...". This is the legal document certifying the cause-effect link.
- **ARTA Abruzzo (Regional Agency for Environmental Protection)**
 - *Documents:* Monthly press releases on bathing and annual reports.
 - *The finding:* ARTA punctually signals when limit exceedances are due to "post-rain river inputs."

Local Chronicle Sources (The Event of September 17, 2024)

The end-of-season event cited is widely documented by the local press.

- **Il Pescara / ChietiToday / Rete8 / Il Centro (Editions of September 17-18, 2024)**
 - *Headlines to search:* "Pescara underwater," "Cloudburst, beach establishments flooded," "River in flood, debris on the beach."
 - *The visual finding:* Videos published by these outlets show water entering establishments from the street side (Riviera Nord) and the beach covered in debris brought by the flood, confirming the early closure of activities.

Technical Sources and Associations (DK15 and Infrastructure)

For technical details on spillways and structural criticalities.

- **Legambiente - "Goletta Verde" Dossier (Annual Editions 2023-2024)**



- *Data:* Legambiente monitors critical points every summer. The point "Pescara River Mouth" and the point "Vallelunga Ditch Mouth" (or neighboring discharges) often result as "Heavily Polluted."
- *The finding:* In the dossiers, they explain that pollution is often due to untreated discharges and sewage overflows (the famous DK15 and similar) that activate with rains.
- **ACA S.p.A. (Azienda Comprensoriale Acquedottistica)**
 - *Documents:* Press releases regarding work on DK15 and the doubling of the purification plant.
 - *The finding:* ACA itself admits, presenting upgrade projects (funded by PNRR or regional funds), that the current system suffers during "water bombs," activating emergency discharges.
- **SIB (Italian Union of Beach Operators) - Confcommercio Pescara**
 - *Spokesperson:* Riccardo Padovano (President SIB Abruzzo).
 - *The finding:* Interviews/statements released after every cloudburst (e.g., August 2023 or September 2024). This is the direct source for estimating economic damage ("drop in turnover," "post-flooding restoration costs," "cancellations").

Scientific Sources (The River "Plume" and Water Color)

- **Research Projects (e.g., d'Annunzio University / Interreg projects)**
 - There are studies on the dispersion of sediments from the Pescara River. Although more technical, they confirm that the load of suspended solids (mud) increases exponentially during floods, creating the turbidity that drives tourists away. A useful reference is the proceedings of conferences on the "Pescara River Contract."

2.4 IMPACTS ON SETTLEMENT AND SANITARY SYSTEMS

The integrity of the productive and social system of "Nuova Pescara" is threatened by a combination of natural factors and historic urban planning choices. The fragility of the territory is not only due to "exceptional rain" and rising temperatures, but to the physical structure created by humans: too impermeable on the coast and too unstable in the hills.

Soil Consumption, Hydraulic Risk, and Landslides

Soil consumption measures the coverage of natural ground with concrete or asphalt. This parameter is the main culprit for the territory's inability to manage new rainfall regimes. The city of Pescara is consistently among the Italian municipalities with the



highest percentage of consumed soil. Over 52% of the municipal territory (ISPRA) is sealed, against a national average of 7% and a regional average of 5%. Effectively, half of the city is a "concrete slab" that forces sewers to manage volumes of water for which they were not designed. Montesilvano follows with consumption exceeding 30-35%. Rapid expansion (large hotels zone and PP1 area) has saturated the coastal strip, drastically reducing drainage zones. Spoltore: Although having lower indices thanks to its agricultural vocation, it records a worrying increase due to new residential allotments (Santa Teresa, Villa Raspa), which transform absorption areas into discharge areas downstream. The conurbation that will arise from the merger will be one of the most cemented in Italy, characterized by an asphalt "plug" on the coast that prevents natural drainage. The cross-analysis of ISPRA data and the investigations and evaluations carried out in the CRESCOAdria Project highlight a vulnerability affecting tens of thousands of residents and businesses.

Particularly alarming is the **Hydraulic Hazard (Floods)**. Pescara is one of the Italian provincial capitals with the highest number of inhabitants residing in at-risk areas. Approximately 36% of the population (over 40,000 people) lives in areas classified as P2 hazard (medium). The "Red Zones" include the floodplain areas, Porta Nuova, the Hospital area, and Villaggio Alcyone. In Montesilvano, the Saline mouth and the industrial zone present a P3 hazard (high).

Regarding **Landslide Hazard (Hydrogeological Instability)**, Spoltore represents the weak point of the system. Vast portions (Caprara, Historic Center, Santa Teresa hills) are in classes P3 and P4 (High and Very High). The clay soil, upon saturation with rain, activates slippages that threaten roads and inhabited centers. In the case of Pescara, zones like Colle Pineta and Strada Colle Renazzo present P3 risks, often aggravated by constructions built on morphologically unstable slopes. Often, rains upstream (Spoltore) cause landslides and pour water downstream (Pescara/Montesilvano). Here, the water finds terrain that is 50% cemented and absorbs nothing, triggering flooding of inhabited zones (Municipal Emergency Plan Pescara).

The historical analysis of events (1992-2024) demonstrates that the frequency of calamitous events has moved from a decadal cadence to a seasonal one, reducing the recovery times of the urban system. The main flood events are reported below:

- **April 10, 1992 (Fluvial Flood):** This is the last major event linked to the flooding of the Pescara River. The river broke its banks at several points, flooding large



areas of the city. From this event, the current cement embankment system was born, which protected the city from subsequent floods but also contributed to the total artificialization of the watercourse.

- **December 2013 (Urban Flood):** A persistent rain event that caused damages estimated at over 10 million euros. It was the signal of the crisis of the secondary drainage system.
- **July 10, 2019:** A supercell unloaded ice stones of 10-12 cm. The toll was war-like: thousands of windshields destroyed, industrial roofs perforated, photovoltaic plants razed to the ground, and 18 injured people arriving simultaneously at the Emergency Room.
- **2021-2022 (Bathing Crisis):** Introduction of temporary bans linked to the DK15 mechanism during summer thunderstorms, signaling the saturation of the combined sewer system.
- **September 17, 2024 (Flash Flood):** Rains with intensity exceeding 50-70mm in less than an hour. The event confirmed the paralysis of essential services and hit the coast and hills simultaneously.

Fragility of Critical Infrastructure

The event of September 2024 mapped the breaking points of the logistical and sanitary system.

- **The Case of the Santo Spirito Civil Hospital:** Represents the point of maximum strategic fragility. Water infiltrations hit basements and operating rooms, particularly the Ophthalmology department. The blockage of urgent surgeries demonstrated how climate risk can paralyze the right to health.
- **Underpasses (Urban Traps):** Via Pola, Via dei Marrucini, and Via Tirino remain "paralysis nodes." Their immediate closure splits city traffic, isolating neighborhoods and preventing the passage of emergency vehicles.
- **Natural Impluvium Areas:**
 - Via del Circuito: Regularly transforms into a raging river, flooding dozens of commercial activities.
 - Porta Nuova and Stadium Zone: Area subject to "sewer backflow." Combined pipes become pressurized, causing manholes to pop in Via Spaventa and Via della Bonifica.



- **Slope Instability (Spoltore):** In the hamlet of Caprara, the 2024 event activated a significant landslide in Via della Libertà, leading to the evacuation of 6 families. In Santa Teresa, the overflowing of minor ditches invaded residential zones due to a lack of riverbed maintenance.

Heat Emergency: The Urban Heat Island (UHI)

While cloudbursts and flash floods represent visible and immediate threats, the metropolitan area of Pescara, Montesilvano, and Spoltore faces a second crisis, more subtle but equally erosive: the rise in average temperatures and the frequency of heat waves. In the 2023-2024 biennium, extreme heat ceased to be a simple seasonal discomfort and transformed into a systemic risk factor deeply affecting public health and the tourism economy. Pescara is not new to torrid summers, but its constant classification as a "red sticker" city in Ministry of Health bulletins highlights a structural problem. The coastal conurbation suffers acutely from the Urban Heat Island (UHI) phenomenon. The main cause lies in dense cementification which, combined with scarce tree coverage (Canopy Cover), prevents nocturnal cooling.

Recent studies, conducted by CNR-Ibe and within the scope of the European project LIFE+ A_GreeNet, show an emblematic datum: in the evening hours, the thermal differential between the cemented center of Pescara or Montesilvano and rural or hilly areas (like Spoltore) can exceed 3-4°C. This "thermal stagnation" prevents the physiological recovery of the organism, making summer nights a chronic stress factor for residents. This climatic anomaly translates immediately into a health crisis. During the summer of 2024, the ASL (Local Health Authority) of Pescara recorded a significant increase in what doctors define as "Heat Codes." The Emergency Room became the terminal for a fragile population, forcing the health authority to activate extraordinary Bed Management plans and open temporary beds to manage overcrowding. The most tragic impact is read in mortality data. Epidemiological analyses suggest that during the heat peaks of July 2024, the over-75 population segment suffered an excess mortality estimated around 3%, with a prevalence of cardiovascular and respiratory crises aggravated by dehydration. Furthermore, the risk for workers should not be overlooked: in the construction and maintenance sectors, thermal stress reduced productivity and increased the probability of accidents, making a revision of working hours in the hottest parts of the day necessary. The final balance of these heat waves is a set of direct and indirect costs weighing on the community. On one hand, the increase in health spending for hospitalizations and emergency services; on the other,



an indirect depreciation of the quality of life in the most densely built neighborhoods, where the absence of greenery makes housing an unhealthy environment without the massive use of air conditioners (with a consequent spike in energy costs).

Interface Fire Risk: Historical Evolution

The analysis of fire risks in the territories of Pescara, Montesilvano, and Spoltore reveals a clear historical evolution, strictly linked to the urban transformation of what is today considered a single large metropolitan conurbation. To fully understand the current situation, one must look at how the territory has changed in recent decades. In the past, up to roughly the 1960s-70s, fire risk in these zones was predominantly rural and agricultural. Fires affected cultivated fields, brushwood, or coastal pine forests in a less built-up context. With the building boom and the urban welding between Pescara, Montesilvano, and Spoltore, the nature of the risk changed radically, becoming **Urban-Rural Interface Risk**. This is the main problem today: houses, roads, and infrastructure are built close to (or even inside) green areas, pine forests, or hills with uncultivated vegetation. The consequence is that a fire that 40 years ago would have burned only brushwood, today immediately threatens condominiums, schools, and roads (as dramatically happened in 2021). The case of the Pineta Dannunziana in Pescara is emblematic. Pescara represents the epicenter of "urban green" risk. The main event is that of August 1, 2021, when a vast fire devastated compartment 5 of the reserve, threatening homes and beach establishments (Regione Abruzzo – AIB Report 2021). This event marked the recent history of the city, making it evident that undergrowth management and green maintenance are not just aesthetic issues but matters of public safety. Even before 2021, minor episodes had occurred, but the frequency has increased with more intense heat waves. The Colli zone (Pescara Colli) is another historically vulnerable area due to the presence of steep terrain and vegetation close to houses. In Montesilvano, the risk has historically shifted from the coast (now almost totally urbanized) towards Montesilvano Colle. The hilly zone, characterized by badlands and spontaneous vegetation, often suffers from summer fires that rise from ditches (e.g., Fosso Mazzocco) towards panoramic homes. The historical evolution here is marked by the progressive abandonment of agriculture in the most impervious zones; fields no longer cultivated fill with brushwood which, drying out in summer, becomes "fuel" for flames. In the case of Spoltore, the risk is patchy ("leopard spots"). Spoltore has maintained a more agricultural soul, but hamlets like Villa Raspa and Santa Teresa have become urban appendages of Pescara. Here the risk is mixed. Typically agricultural fires still occur (stubble burning escaping



control), but increasingly often these fires threaten new residential allotments built in ex-agricultural areas. The recent historical evolution (last 10-15 years) sees the entry of new factors that have raised the risk level: • The "Garbino": The hot downslope wind from the Apennines is a historical constant, but combined with higher average temperatures (Climate Change), it creates "explosive" conditions that were rarer in the past (ARPA Abruzzo – Meteorological data on heat waves and "Garbino" wind). In summary, if historically one fought fire to save the harvest or the forest, today in Pescara, Montesilvano, and Spoltore, one fights fire predominantly to save infrastructure and homes. Civil Protection planning is evolving towards joint management (municipal boundaries being physically indistinguishable), focusing on the cleaning of private uncultivated lots, which today represent the true trigger for large urban fires.

Table 10. Main Risk Profiles

Scope	Pescara	Montesilvano	Spoltore
Soil Consumption	Very high percentage (>52%, source ISPRA). High urban density, significant coastal impermeabilization. Expansion of large hotels zone and PP1 area.	Medium-high percentage (30–35%). Strong urbanization of coastal strip; saturation of natural drainage zones.	Lower percentage (<20%) but growing in plain hamlets and new allotments (Santa Teresa, Villa Raspa). Transformation of absorption areas into discharge areas.
Hydraulic Risk (PAI)	P2 and P3 areas along Pescara river: floodplains, Porta Nuova, hospital zone, Villaggio Alcyone. About 36% population exposed (>40,000 inhabitants). Historical events: 1992, 2013, 2019, 2024.	P3 areas near the Saline mouth and industrial zone. Coastal criticalities; outflows towards Pescara.	Risk localized in valley bottoms and plain areas. Historical events: localized landslides and flooding of minor ditches.



Landslide Risk (PAI)	Colli: Colle Pineta, Strada Colle Renazzo. P3, aggravated by constructions on unstable slopes.	Internal hills (Montesilvano Colle). Localized P3; connection with outflows towards coast.	Diffuse and significant: Caprara, historic center, Santa Teresa hills. P3–P4. Saturation of clay soil, risk of activation of slippages and flooding downstream.
Interface Fires	High in hilly areas and Pineta Dannunziana. Relevant event August 1, 2021.	Prevalent in hilly areas and ditches (Fosso Mazzocco). Growing with agricultural abandonment.	Diffuse in agricultural areas and residential expansion hamlets (Villa Raspa, Santa Teresa). Mix of agricultural and interface fires.
Urban Heat Island (UHI)	High: thermal differential 3–4°C between urban center and hilly/rural areas. Impacts on public health and infrastructure. Increase in "Heat Codes," nocturnal thermal stress, mortality over-75 +3% in summer peaks.	Moderate: densely built coastal strip; 2–3°C above rural areas. Accentuated thermal stress in evening hours; increased vulnerability in densely urbanized neighborhoods.	Low-moderate: more ventilated hilly areas and residual vegetation mitigate UHI effects; risk to vulnerable populations in densified hamlets.
Sanitary Risk: Impact on settlement and hospital systems	Critical: Santo Spirito Civil Hospital exposed to infiltrations and operating room blockages. Underpasses and main roads subject to hydraulic paralysis. ER overcrowding and increased	Medium-high: connection with Pescara and outflows from the hill increase vulnerability of local health systems. Extreme weather events require	Medium: limited health infrastructure, risk of evacuations following landslides/flooding. Fragile population in hilly hamlets, exposed to indirect UHI effects and meteorological events.



	hospitalizations during heat waves and floods.	activation of temporary triage points.	
Territorial Interrelation	Receives outflows from upstream; high urban and sanitary vulnerability; critical connection between coast and hills.	Mixed coastal-hilly system; reception of outflows from Saline basin; intermediate vulnerability.	Hilly area; potential origin of landslides and outflows towards the valley; limited infrastructural response capacity.

Sources

Analyses on soil consumption, hydraulic risk, landslides, and interface fires in the Pescara–Montesilvano–Spoltore area are based mainly on national and regional institutional sources.

- For **soil consumption**, data derive from the National Report on Soil Consumption and ISPRA cartographic open data (SNPA System), which provide updated municipal, regional, and national comparisons.
- **Hydraulic hazard (P2–P3)** is documented by the Hydrogeological Asset Plan (PAI) maps of the District Basin Authority of the Central Apennines, integrated with data on exposed population contained in the ISPRA Report on Hydrogeological Instability. Local operational scenarios refer to Municipal Emergency Plans and Civil Protection planning.
- For **landslide risk**, P3–P4 classifications are taken from PAI Abruzzo and the national IFFI database managed by ISPRA, supported by regional geological reports.
- Dynamics of **urban runoff and systemic vulnerability** are consistent with SNPA guidelines on rainwater management and national environmental regulations (Legislative Decree 152/2006), as well as Adriatic cooperation studies like the CRESCOAdria project.
- **Urban-rural interface fire risk** is defined according to Civil Protection Department guidelines; data on events in Abruzzo, including the fire of August 1, 2021, at Pineta Dannunziana, come from AIB reports of the Abruzzo Region.



- **Territorial transformations and agricultural abandonment** are documented by ISTAT analyses on land use and ISPRA reports on terrestrial ecosystems.
- Finally, **climatic factors** (heat waves and "Garbino") are supported by ARPA Abruzzo meteorological bulletins and ISPRA climate reports.
- **Health and Mortality:** Data derive from official Ministry of Health bulletins and reports from the Department of Epidemiology of the SSR Lazio, which monitors Pescara as a sample city for the Middle Adriatic.
- **Hospital Management:** Information on ER access and extraordinary plans is drawn from official press releases and technical reports of the ASL of Pescara (Summer 2024).
- **Urban Climatic Analysis:** Data on thermal differential and heat islands are supported by CNR-IBE studies and strategic documents of the LIFE+ A_GreeNet project, focused on the climatic resilience of the Abruzzo coast.
- **Tourism Sector:** Evaluations on economic impact and the mucilage phenomenon are based on seasonal monitoring by trade associations (Federalberghi Pescara and Confcommercio) and ISTAT data regarding length of stay.

2.5 VULNERABILITY OF THE INDUSTRIAL AND LOGISTICS SECTOR

The Pescara–Montesilvano–Spoltore metropolitan area presents a systemic vulnerability to extreme weather conditions, which cuts across all economic sectors, from industrial production to urban logistics. The effects of extreme events, such as intense rains, hailstorms, and heat waves, are not limited to direct damage to buildings but compromise the continuity of production and distribution chains. The Saline Industrial Zone, located between Montesilvano and Città Sant'Angelo, constitutes one of the main production hubs of the vast area. Large portions of the area fall into hydraulic hazard P2 (medium) and P3 (high), with a concrete risk of flooding of the Saline River, as confirmed by the red alerts of recent years. Metalworking and manufacturing companies operate with Computer Numerical Control (CNC) machinery and automated systems highly sensitive to humidity, sediment, and infiltrations. Flood events or cloudbursts cause:

- Structural damage to industrial buildings.



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- Prolonged machine downtimes due to the need for replacement or recalibration of machinery, with inactivity times that can reach weeks.
- Interruption of the production chain and possible compromise of national and international orders.

The hamlets of Spoltore, particularly Santa Teresa, constitute strategic logistical nodes for couriers, depots, and food distribution centers. In the event of extreme meteorological events:

- The closure of underpasses and main arteries (SS16 bis, Via Tiburtina) causes a paralysis of so-called “last mile logistics.”
- Secondary arteries, subject to superficial landslide movements, isolate artisanal warehouses located in the valley.
- Delays in deliveries, increased operating costs, and interruption of the distribution of perishable goods occur.

These logistical vulnerabilities are strictly interconnected with the geomorphology of the territory, where the hills of Spoltore can generate outflows and landslides that transport mud towards industrial and road infrastructure. Heat waves, like that of July 2023, highlighted the fragility of the urban electrical grid: underground cables suffered overheating due to high demand for air conditioning, generating prolonged blackouts. Effects on the productive sector include:

- Interruption of industrial production cycles.
- Loss of the cold chain in the agri-food sector and medium-sized distribution.
- Direct damage to artisan workshops (pastry shops, delis, ice cream parlors) and supermarkets, estimated at hundreds of thousands of euros in recent summers [CNA Abruzzo, 2023].

Historical dynamic of economic damages (2019–2024)

Extreme events recorded in the last five years allow for outlining a coherent economic picture:



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- **July 2019:** Hailstorm with damages estimated >40 million euros, comprising destroyed vehicles, perforated industrial roofing, and damaged skylights and shop windows.
- **Floods 2023–2024:** Compensation claims ranging between 15 and 20 million euros, including direct and indirect damages (business interruption, lost revenues, restoration costs). The increased frequency of extreme events has led insurance companies to classify the area as a high atmospheric risk zone, with concrete consequences:
 - Insurance premiums increased on average by 20–30%.
 - Introduction of high deductibles (>€5,000) limiting coverage for medium-low entity damages.
 - Exclusion of basement warehouses from standard policies, leaving many commercial establishments in central Pescara uncovered.

The growing frequency and intensity of extreme events make it a priority to reduce downtime and guarantee operational continuity. Necessary investments including anti-backflow valves, watertight bulkheads, and energy storage systems are no longer optional, but prerequisites for business survival in the area.

Sources

- ISPRA (2023) – Report on Hydrogeological Instability in Italy: Pescara and Montesilvano data, PAI hydraulic hazard.
- CCIAA Chieti-Pescara (2023) – Economic Observatory: corporate mortality and correlation with calamitous events.
- Confcommercio Pescara (2023–2024) – Post-event press releases: damage estimates for commerce and industrial production.
- Regione Abruzzo – Civil Protection Department (2023) – PGRA Pescara River and Saline Basin.
- ANIA (2023) – Report on protecting businesses from natural risks: classification of the Pescara area as high risk.
- CNA Abruzzo (2023) – Report on damages to artisan workshops and medium distribution.



- Local Chronicles (Il Centro / ANSA, 2023–2024) – Technical documentation on recent blackouts and floods.

2.6 BIODIVERSITY AND ECOSYSTEM SERVICES: AN ECOSYSTEM IN FLUX

The Pescara-Montesilvano-Spolto metropolitan area hosts precious ecological niches—from coastal pine forests to river corridors, up to the sandy bottoms of the Adriatic—which today suffer a "triple threat": rising temperatures, habitat fragmentation caused by urbanization, and the invasion of alien species. Biodiversity protection is not just an ecological priority, but an economic necessity to sustain fishing, tourism, and urban resilience.

The warming of the Middle Adriatic has favored the settlement of invasive tropical species, with devastating impacts on local supply chains. The **Invasion of the Blue Crab (*Callinectes sapidus*)**, reported for the first time in Pescara in 2020, has colonized the entire coast. Defined by fishermen as a "killer of the seas," it is an extremely aggressive predator that feeds voraciously on clams, mussels, and cuttlefish eggs. Its presence compromises the biodiversity of the seabed and destroys fishing equipment (cutting nets), necessitating the adoption of specific pots for containment. Rising temperatures and hypoxia phenomena (lack of oxygen) linked to mucilage are leading to the rarefaction of indigenous benthic species (Sentinel Species), essential for natural water filtration.

Other criticalities concern **Historical Pine Forests** due to the presence of Parasites and Thermal Stress. The Pineta Dannunziana (Pescara) and the Pineta di Santa Filomena (Montesilvano/Pescara) are the last "relics" of the great coastal Mediterranean forest, today gravely threatened. These pine forests are facing the **Emergency *Toumeyella parvicornis***. Reported in Pescara since 2019, the "pine tortoise scale" is devastating the heritage of *Pinus pinea* (stone pine). This parasite sucks sap and produces abundant honeydew, favoring the growth of sooty mold (a black powder) that blocks photosynthesis, leading the plant to death within a few years. Furthermore, the Pineta Dannunziana still suffers damages from the **Impact of the 2021 Fire**. Natural recolonization is hindered by cycles of extreme drought that prevent new shoots from rooting, favoring infestation by species less valuable from the perspective of CO2 abatement and urban cooling.

Other criticalities concern the poor quality of green areas, confirmed by the Life+A_Greenet Project, and the role of the Pescara and Saline rivers. Specifically, the Pescara and Saline rivers should act as "biodiversity highways" between the



Apennines and the Adriatic, but wild anthropization has compromised their functionality.

The **Saline River** is afflicted by **Historical Pollution**. Provocatively defined as "the longest linear landfill in Italy," the Saline suffers from decades of industrial spills and proximity to critical sites like the former Villa Carmine landfill. The disappearance of native species like river crayfish is a signal of the watercourse's chemical-physical degradation. Furthermore, there is the **Risk of Hydraulic Works**. Embankment projects and new jetties at the mouth threaten residual river fauna if not accompanied by serious environmental impact assessments. Despite urbanization along the banks in Spoltore and Pescara, the river maintains a vital role for migratory birds. The area of the Pescara mouth, thanks to neighboring dunes and shallow waters, has become a strategic resting point during the migration period (August-October). Here, Little Egrets, Grey Herons, Kingfishers, and rare species like the Bar-tailed Godwit, a record migrant capable of covering transoceanic distances, stop regularly.

However, the **Pescara River** reveals an **Interruption of Continuity**. Upstream, in the stretch between Santa Teresa di Spoltore and Cepagatti, the presence of barriers and small hydroelectric plants (often at the center of environmentalists' legal battles) interrupts ecological continuity, hindering the upstream migration of fish species and altering the natural transport of sediments towards the coast. Finally, the **hilly zones**. In hilly zones, the threat concerns the loss of rare habitats and the pollinator crisis.

- **Biodiversity of Badlands (Calanchi):** The clay walls of Spoltore and Montesilvano Colle host unique xerophilic plants (lovers of arid conditions). Erosion accelerated by "water bombs" and agricultural abandonment are simplifying these ecosystems.
- **Decline of Pollinators:** Habitat fragmentation reduces the biomass of wild bees and butterflies, essential for soil fertility and the productivity of local crops (oil and wine).

Table 11. Synthesis table: risks and impacts on biodiversity

Ecological Target	Climatic/Anthropic Threat	Consequence on Biodiversity	Economic/Social Impact
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Sandy Bottoms	Warming waters	Invasion of Blue Crab	Damage to nets and mollusks; crisis for small-scale fishing.
Historical Pine Forests	Extreme heat and parasites	Pine death (<i>Toumeyella</i>)	Loss of shade; increase in Urban Heat Island.
River Mouths	Floods and debris	Destruction of migratory nests	Loss of attractiveness for birdwatching and green tourism.
Rivers (Stem)	Urbanization and discharges	Interruption of ecological corridors	Reduced capacity for natural water purification.
Hills/Badlands	Erosion and drought	Disappearance of xerophilic species	Soil fragility and drop in pollinating insects.

SOURCES

Marine Biodiversity and Invasive Species (Blue Crab and Tropicalization)

- ISPRA (Institute for Environmental Protection and Research): Report on climate change indicators in Italy. Provides data on the "southernization" of the Adriatic and the spread of alien species like *Callinectes sapidus* (Blue Crab).
- ARTA Abruzzo (Regional Agency for Environmental Protection): State of the Environment Report (RSA) - Sea Focus. Periodically documents water quality, surface temperature peaks, and the presence of algal blooms/mucilage in the Pescara-Montesilvano stretch.
- Ministry of Agriculture and Food Sovereignty (MASAF): Emergency decrees for combating the Blue Crab (2023-2024). Contain impact analyses on small-scale fishing and Adriatic sandy bottom biodiversity.
- CNR-ISMAR (Institute of Marine Sciences): Studies on current circulation and thermal impact in central Adriatic coastal ecosystems.

Terrestrial Ecosystems and Pine Forests (Dannunziana and Santa Filomena)



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- Municipality of Pescara - Green Management Sector: Management Plan of the Pineta Dannunziana Nature Reserve. Includes post-fire reports from August 1, 2021, and studies by the University of L'Aquila on forest regeneration.
- Project LIFE+ A_GreeNet (2021-2025): The main source for the climatic resilience of the vast area. The project involves Pescara and neighboring municipalities in creating green corridors and protecting urban biodiversity against the "heat island" effect.
- Regional Phytosanitary Service (Regione Abruzzo): Technical bulletins on the spread of the parasite *Toumeyella parvicornis* (Tortoise scale) in maritime pines of the Pescara coast.
- Biodiversity Carabinieri Department of Pescara: Managing body of the State Nature Reserve "Pineta di Santa Filomena" (Montesilvano), source for data on nesting avian fauna and conservation status of the dune forest.

River Corridors (Pescara and Saline) and Avifauna

- District Basin Authority of the Central Apennines (AUBAC): Hydrographic District Management Plan. Provides analyses on habitat fragmentation along the banks of the Pescara and Saline rivers.
- WWF Abruzzo / LIPU Pescara: Annual reports on wintering and migratory avifauna censuses at river mouths (e.g., IWC censuses - International Waterbird Census).
- Regione Abruzzo - Agriculture and Environment Department: Regional Strategy for Adaptation to Climate Change (SRACC). Analyzes the vulnerability of hilly and river biodiversity regarding drought and flood phenomena.

Geology and Micro-habitats (Spoltore and Montesilvano Colle)

- Geological Map of Italy (Sheet 141 - Pescara): Describes the nature of clay soils and badlands, habitats for xerophilic floristic species (arid lovers).
- "G. d'Annunzio" University Chieti-Pescara (Department of Engineering and Geology): Studies on local geomorphology and the impact of erosion on the biodiversity of Spoltore's hilly slopes.

3.BENCHMARK AND GOOD ADAPTATION PRACTICES



The analysis of Nuova Pescara has been enriched through comparison with methodologies developed within territorial cooperation programs (Interreg Italy–Croatia) and extended partnerships (iNEST), with particular reference to academic exchanges between UNICAM, IUAV, and the University of Rijeka. The themes of water management and the land–sea relationship were addressed starting from the presentation of several projects introduced by IUAV-CORILA on the occasion of another research project developed by the University of Camerino, the Vitality – Ecosystem of Innovation Project, in September 2025. The discussion, involving researchers from UNICAM and IUAV, joined by several researchers from the University of Rijeka, focused on water management and the land–sea relationship, beginning with the presentation of projects by IUAV-CORILA that triggered the debate.

3.1 iNEST Project – SPOKE 04 – City, Architecture, Sustainable Design

iNEST – Network 4 Energy Sustainable Transition – is one of the 14 large extended partnership projects selected by the Ministry of University and Research (MUR), funded by the European Union – NextGenerationEU – under Mission 4. Spoke 4 of the Project is dedicated to sustainable design understood as care and maintenance of the built environment at all scales and in all its aspects: from territory, to city, to architecture. The territory concerned includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige, and the Autonomous Province of Bolzano. This is an area that has demonstrated vulnerabilities due to climate change and to the specific characteristics of the dispersed urban settlement pattern, as well as the ways in which energy and water infrastructure networks have developed.

The project used water as a key theme to read and reinterpret the territory. From the late 1990s to 2008, the area increased its impermeable surface by 20%; moreover, it has been affected by floods and sudden heavy rainfall events. The project sought to interpret the territory through a multi-hazard assessment that does not rely on sophisticated modeling systems but instead systematizes available data through the construction of a “Multi-Hazards Synthesis Map,” capable of conveying the overall hazard level of the territory.

From a critical review of the literature, a set of relevant hazards for the territory was identified, with reference to the SDGs and the European Environment Agency. Once the list was defined, the most useful indicators to measure and map each hazard were selected. Links to various datasets were established, and the data were normalized on



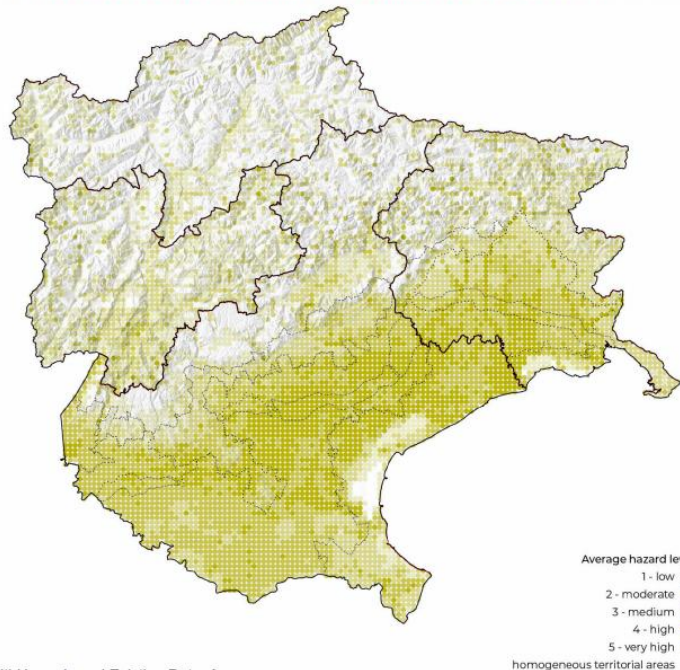
a scale from zero to five, where five represents the maximum risk level for that hazard in a given area, and zero represents the minimum level or absence of data. The objective was to create a map capable of communicating clearly and directly to decision-makers. The so-called “safe spots” were also identified—areas considered safe according to locational criteria and the needs they address. Furthermore, recurring territorial structures were highlighted (the coastal strip, the low plain, spring areas, the upper plain, hills, and mountains) and their interaction with risks. The data were organized into a matrix to identify territorial bundles resulting from the combination of multiple hazards, to be related to specific planning interventions and policies capable of responding to the identified risks. This made it possible, on the one hand, to consider which projects could be replicated based on similarities and potential solutions.

Fig.1 Multihazards Summary Map

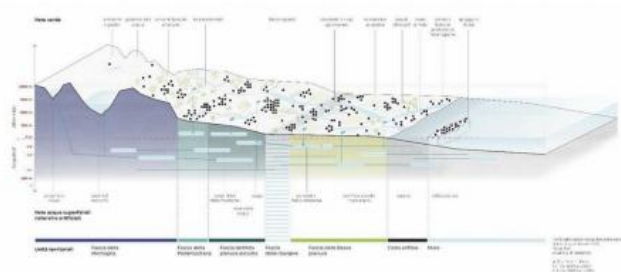
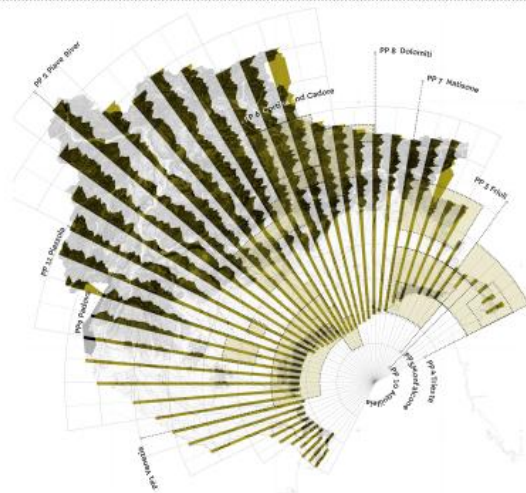


Mappa di sintesi Multi-hazards

INTERCONNECTED NORD-EST INNOVATION ECOSYSTEM



Ref: Longo, A., Semenzin, C., & Zardo, L. (2025). Multi-Hazards and Existing Data: A Transboundary Assessment for Climate Planning. *Land*, 14(3), 548.



Designed and conceptualized by Fabian et al. (see iNEST publication at the end of this presentation)

Figure 3. The North-East in section, the shape of the territory observed from the point of view of the water network. Source: P. Cigalotta, T. Frausin, 2024.

3.2 iNEST Project – SPOKE 08 – Land Sea



The project “NEST SPOKE 08 – Land Sea,” developed through collaboration between urban planning groups from the University of Trieste and IUAV University of Venice, aims to innovate spatial planning by extending it integratively from land to sea. The starting point is the awareness that traditional planning conventionally stops at the coastline. The innovation lies in actively including the vast and complex maritime space within planning logic. The first phase required a careful state-of-the-art review and comprehensive data collection on sea uses, fundamental for understanding the multiple activities and interactions taking place in marine and coastal environments. The key concept developed is “land-sea interaction.” This is not a simple boundary line or continuous, immutable buffer. Rather, it is a “mutable buffer,” whose dimensions, intensity, and relationships transform according to the specific uses projecting from land to sea and vice versa, also considering historically shaped coastal uses. This “dynamic buffer” is further complicated today by meteorological-climatic and ecological dynamics, which exert variable impacts on spaces and human activities. A crucial research area concerned identifying “geographies linked to climate threat.” The explicit intent is to understand which territories may need to be “abandoned” because maintaining them would no longer be economically or environmentally sustainable in the long term. In such scenarios, the project aims to quantify functional, socio-cultural, and natural losses resulting from these choices. This preparatory work supports a robust evaluative approach to complex territorial management decisions.

After analyzing specific “hotspots,” the research focused on mapping territorial elements previously difficult to quantify or absent from traditional geographic databases. A significant example is measuring travel times between two points, considering various transport modes and explicitly prioritizing slow and sustainable mobility. All these progressively defined “layers” aim to provide deep awareness of what exists in the territory—not only individual assets but their interactions, strengths, and weaknesses. The outcome is a “true land-sea interaction map.”

Subsequently, the project assessed current and future vulnerability to climate impacts, analyzing three categories:

Heat: Short- to medium-term scenarios (25–30 years) were used. The 95th percentile defined the critical temperature threshold. Forty-seven satellite images were processed. The map shows how often a pixel exceeded the threshold during the warm season, identifying areas “not ready to be resilient to heat impact.” Both urbanized and natural areas were included, suggesting interventions such as increasing vegetation to improve adaptability and reduce wildfire risk.



Flooding: Based on the latest Flood Risk Management Plan. The territory faces sea-level advance and intense rainfall causing riverbank breaches. Understanding vulnerability geographies allows evaluation of functions and values at risk.

Sea-Level Rise: Projections for 2100 show dramatic scenarios, including the near disappearance or severe alteration of the Grado Lagoon, implying major territorial and ecological loss.

All knowledge layers led to vulnerability measurement. Rather than relying solely on quantitative methods, the project used information overlay, a simple yet powerful method allowing significant updates even with limited knowledge. Decision support aims not at deterministic choices but at improving knowledge and integration.

The final objective is a Geoportal for the entire Upper Adriatic. Analytical work results in “transversal sheets” summarizing each identified transect’s characteristics, providing decision support that outlines “what exists and what will be lost,” geographically identifying where losses will occur.

iNEST Project – Risk Management Insights

The iNEST project represents an opportunity to rethink territories in terms of increased usability, attractiveness, and water-related adaptation. It proposes climate adaptation actions through Nature-Based Solutions (NbS) to mitigate river and coastal flood risks; developing synergies with cycling mobility and landscape enhancement; and promoting tools to support implementation, recognizing that NbS often require more space.

Concrete interventions include creating wetlands acting as natural “sponges” and strategically relocating riverbanks and coastal defenses to allow controlled flooding and renaturalization. The project integrates adaptation with cycling mobility and green tourism, generating economic benefits.

Implementation tools include public land acquisition with compensation or agreements with private owners for sustainable management, including payments for controlled flooding. Mechanisms such as River Contracts and PES (Payments for Ecosystem Services) are also considered.

The case study of the Grado and Marano Lagoon exemplifies complexity and value. Historically exposed to climate risks, it requires rethinking defenses to restore land to water, transforming potential loss into long-term ecological and economic gain. Past

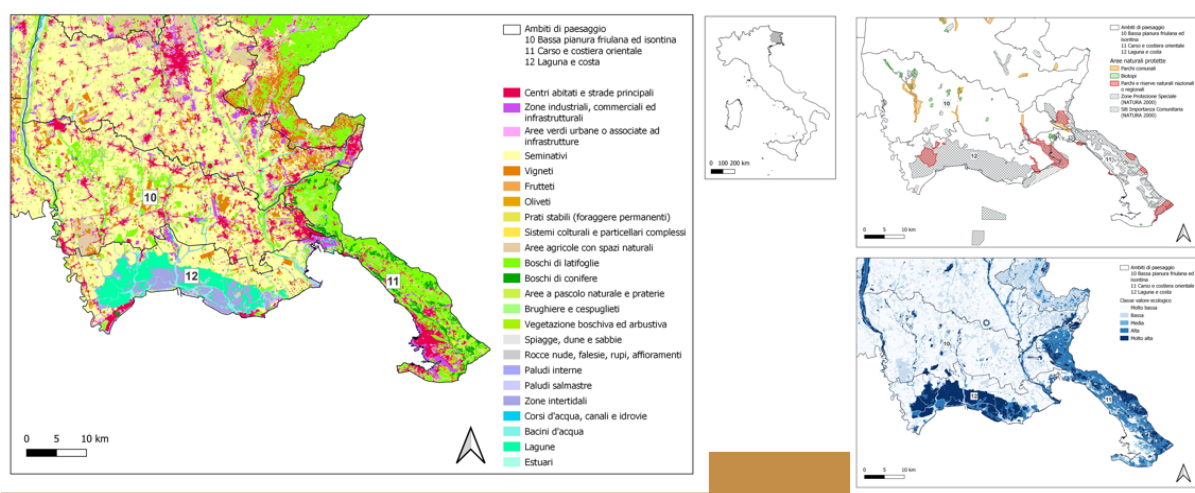


experiences show NbS reduce flood risks and generate socio-economic benefits such as tourism development and ecological improvement.

In summary, iNEST proposes integrated adaptation as an opportunity for territorial valorization and long-term development.

Fig.2 Land Use

CASO STUDIO: UN TERRITORIO COMPLESSO



3.3 PRIMA-RESMAB and Horizon Europe – NATALIE



The central theme is water's crucial role in territorial governance, explored through two European projects: RESMAB (PRIMA) and NATALIE (Horizon Europe).

RESMAB views water as an enabling factor for socio-ecological resilience, adopting the WEF Nexus (Water-Energy-Food-Ecosystems) approach to overcome sectoral divisions. It focuses on Mediterranean hotspots, promoting co-created, flexible adaptation solutions within biosphere reserves.

NATALIE considers water as infrastructure supporting Nature-Based Solutions across diverse climatic contexts. It emphasizes communication, co-creation, sustainability, and citizen science.

The Italian pilot in Veneto tests “gentle maintenance” of riverbanks and morphological canal modification, comparing traditional and innovative methods over four years. Expropriations were positively received due to agricultural benefits. The project monitors hydrological, ecological, and socio-economic co-benefits, promoting replicability and stronger community connections.

Both projects demonstrate that water governance requires integrated, participatory approaches beyond purely technical solutions.

3.4 ADAPTATION MASTERPLAN FOR THE PADUA INDUSTRIAL AREA

The strategic adaptation Masterplan for the Padua Industrial Zone (ZIP), funded by MASE, integrates climate adaptation into a highly vulnerable productive area characterized by high soil impermeability, summer heat, and hydraulic issues.

It is structured around three strategies:

Water Management: Sustainable urban drainage systems to reduce flood risk.

Heatwave Mitigation: Material selection, shading, and urban heat island reduction.

Vegetation Increase: Improving microclimate and ecological networks.

The masterplan integrates existing planning tools and adopts a synoptic, multi-level approach combining structural urban interventions and replicable measures. Actions are synergistic, producing climatic, hydraulic, and ecosystem benefits.

Fig.3 Ecology Strategy



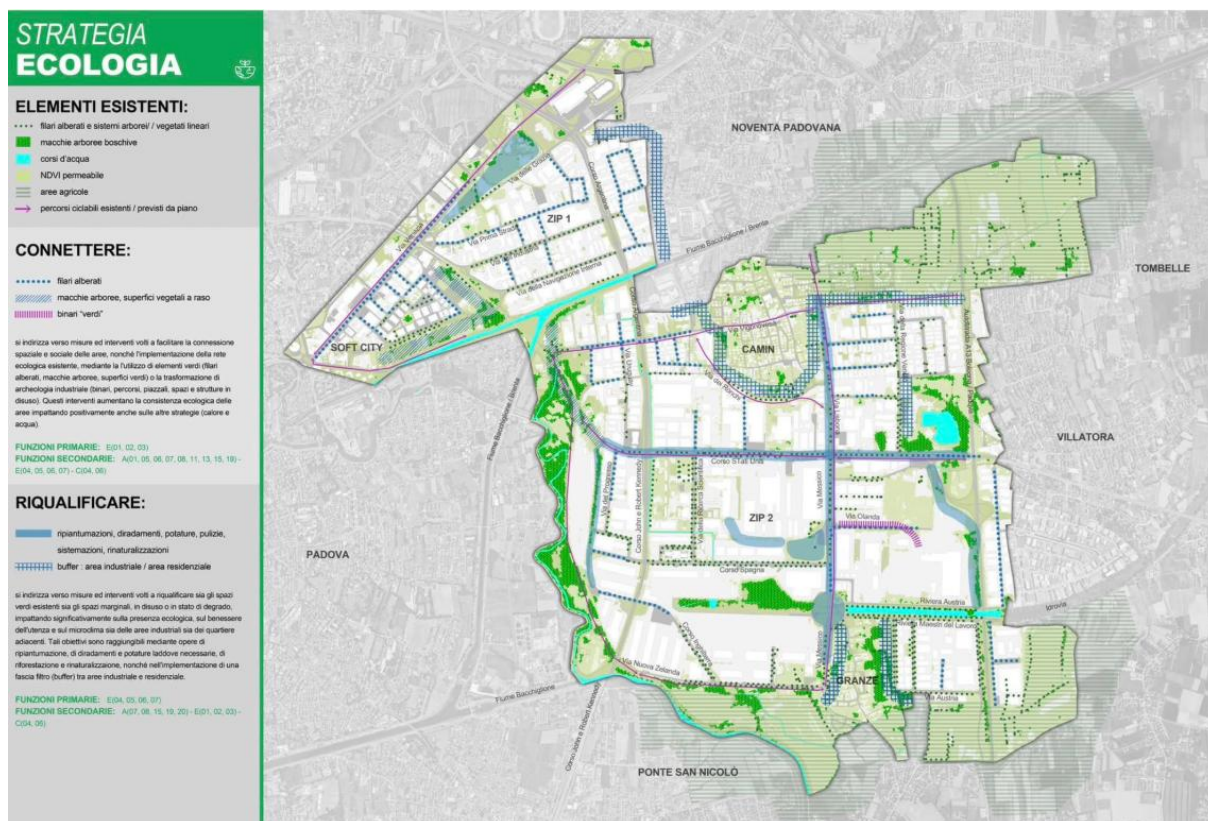
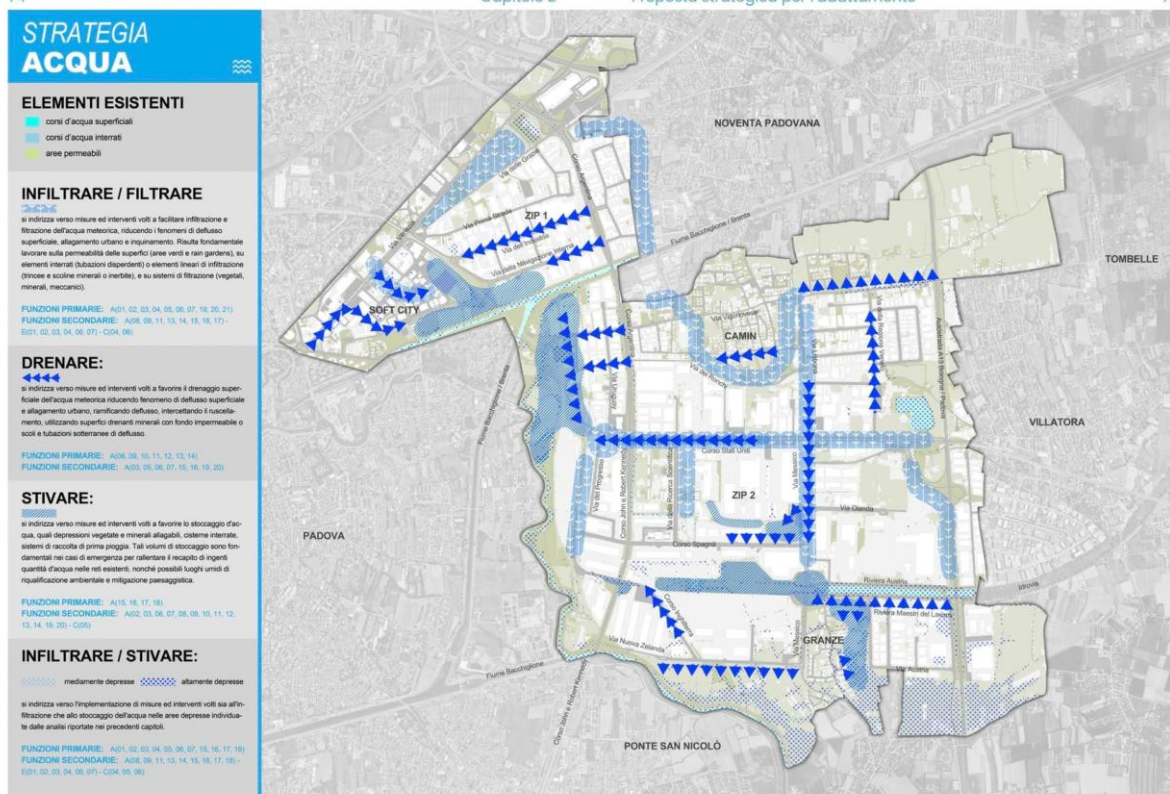


Fig.4 Water Strategy





The case studies presented (iNEST, Horizon, Padua ZIP) are not merely theoretical examples, but operational solutions directly applicable to Pescara's critical issues. Here is how the Good Practices from the first document can become Strategic Solutions for Nuova Pescara:

From the “Coastline Approach” to “Land-Sea Interaction”

- **The Problem in NuovaPescara:** The document on Nuova Pescara describes fragmented management: the river carries pollutants and sediments (the “plume”), the breakwater alters currents, and the reefs trap mucilage. Sea and land are still treated as two separate entities divided by an administrative boundary line.
- **The Solution (iNEST Spoke 08 :** The approach developed between Trieste and Venice proposes moving beyond planning that stops at the shoreline by introducing the concept of a “Mutable Buffer.”

o **Practical application:** For Nuova Pescara, this means creating a single plan that includes the river basin (land) and the coastal strip (sea) as one integrated system. Urban planning decisions in Spoltore (land) must be tied to impacts on bathing water



quality in Montesilvano (sea), using the “geographies of climate threat” to determine where construction should cease or where retreat is necessary to allow the sea to expand without causing damage.

River Management: From Concrete to Nature-Based Solutions (NBS)

- **The Problem in Nuova Pescara:** The river system (Pescara and Saline) is rigid. Concrete embankments and land consumption (52% in Pescara) accelerate water toward the mouth, causing system overload (DK15) and post-rain bathing water pollution (“cloudbursts”).

- **The Solution (NATALIE Project & Davide Longato’s Insights):** The cited projects propose “gentle maintenance” and the creation of expansion areas (“sponges”).

- o **Practical application:** Instead of raising the Saline embankments or channeling streams in Spoltore, Nuova Pescara could replicate the example of the Veneto “Acque Risorgive” Consortium: moving embankments back in agricultural zones (compensating landowners) to create wetlands that absorb upstream floods, preventing water from reaching the city center explosively and reducing sewer overflow activation.

The Padua Model for the Saline Industrial Area

- **The Problem in Pescara:** The Saline industrial zone and logistics areas are vulnerable to flooding (machine shutdowns) and heatwaves (blackouts and thermal stress).

- **The Solution (Padua ZIP Masterplan):** The Padua Masterplan is a perfect operational manual for the industrial area between Montesilvano and Città Sant’Angelo.

- o **Practical application:**

1. **Drainage:** Mandatory permeable pavements in logistics yards to reduce sewer load.
2. **Materials:** Use of cool roofs (reflective roofs) on warehouses to lower internal temperatures and reduce energy consumption (mitigating blackouts).
3. **Strategic Greenery:** Targeted planting to shade parking and loading/unloading areas, improving operational resilience.

Multi-Hazard Mapping for Unified Governance



- **The Problem in Pescara:** The merger of the three municipalities inherits overlapping risks: landslides in Spoltore, floods in Pescara, erosion in Montesilvano. Currently, data are fragmented among different bodies (ARTA, ISPRA, Municipalities).

- **The Solution (iNEST Spoke 04):** The creation of a standardized “Multi-Hazards Matrix.”

- o **Practical application:** Nuova Pescara is moving in this direction by seeking to create a single risk map that overlays all data. This would allow identification of “territorial bundles” (areas where landslide, flood, and heat risks overlap) and give absolute priority to investments in those areas, avoiding scattered and uncoordinated spending.

Water-Energy-Food Nexus for Hill Agriculture

- **The Problem in Pescara:** Agriculture in Spoltore and Montesilvano Colle suffers from drought and saltwater intrusion (clay “cracking”).

- **The Solution (RESMAB Project – PRIMA):** The WEF Nexus (Water-Energy-Food) approach and resource reuse.

- o **Practical application:** The reuse project for treated wastewater from the Montesilvano treatment plant (mentioned in document 2) should not remain an emergency measure but become structural, as in RESMAB. Treated water must become the standard resource for peri-urban agriculture, integrating energy production (from treatment sludge) to reduce pumping costs toward the hills of Spoltore.

Citizens as “Sensors” and Social Acceptance

- **The Problem in Pescara:** Adaptation interventions (e.g., retention basins or expropriations) often face resistance.

- **The Solution (NATALIE Project):** Active involvement (Citizen Science) and demonstration of co-benefits.

- o **Practical application:** As demonstrated in the Veneto case, where expropriation was positively received because it resolved agricultural usability problems, Nuova Pescara must communicate the “economic advantage” of adaptation. Explaining to tourism operators and residents that an upstream wetland means fewer bathing bans downstream (and therefore higher revenue) is fundamental for acceptance of the Plan.

4. WORKSHOP WITH STAKEHOLDERS



The Workshop organized on February 24th at the Aurum in Pescara, through a concise and cross-cutting presentation of the knowledge framework and critical issues outlined in the previous sections and in the Project's main Deliverables, aimed to engage with Stakeholders from the various economic sectors of the pilot area to:

Validate the information framework: Confirm whether the illustrated vulnerabilities correspond to the operational reality of your sector.

Express needs: Highlight specific aspects or underestimated critical issues (e.g., regulatory, logistical, infrastructural) that hinder your activity.

Suggest priority and concrete actions that the CRESCO Adria Pilot Area plan should adopt to guarantee the safety and economic development of the territory.

The workshop began with the presentation of the Project's initial results, using maps and graphs that evidenced the physical and infrastructural fragilities of the Nuova Pescara territory as it grapples with climate change (flooding and temperature rise). Based on this knowledge, and through the reconnaissance of pressures and vulnerabilities in various economic and social development sectors, local stakeholders—representing the main economic sectors of the three municipalities under study and technical offices—were asked to validate the knowledge framework, highlight specific needs, and propose operational solutions, starting from the assumption that climate change imposes a radical transformation of territorial planning.

After illustrating the vulnerabilities of the different sectors in the Pescara-Montesilvano-Spoltoire metropolitan area (Blue Economy; Green Economy; Coastal Tourism; Urban System and Health; Industry and Logistics; Biodiversity), UNICAM presented a proposal for a strategic vision for "Nuova Pescara" by 2027 (the date of the merger of the three Municipalities), based on three axes of intervention:

A. Infrastructural Adaptation: The "Sponge City"

To contrast excessive surface sealing (impermeabilization), the following is proposed:

De-paving: Systematic replacement of asphalt with draining materials in parking lots and squares.

Sustainable Drainage: Creation of draining trenches, retention basins, and rain gardens along critical arteries to slow down flood peaks.



Hydraulic Invariance: Obligation for new constructions and renovations to manage rainwater within the lot, without burdening the public network (Copenhagen/Rotterdam model).

B. Innovation, Nature, and Biodiversity

Urban Forestry: Creation of continuous green corridors (river-hill-coast) to reduce heat islands and the use of green roofs/vegetated walls on buildings.

River Management: Shift from rigid defense to the creation of river parks with a function of "controlled lamination" (flood retention), to live safely with floods.

Technology: Implementation of early warning systems and advanced monitoring to guarantee reactivity.

C. Governance and Incentives

The merger allows for unitary planning (from upstream to downstream) of the hydrogeological structure and civil protection. To accelerate the transition, the introduction of a "Resilience Rating" is proposed: a system of fiscal and building incentives for private individuals and companies investing in self-protection solutions and Nature-Based Solutions.

The presented strategy aims to convert urban regeneration from a cost into a strategic investment. A city capable of absorbing water, mitigating heat, and protecting biodiversity will be the only kind able to remain attractive, insurable, and competitive over the next thirty years.

At the end of UNICAM's presentation, the debate opened with the stakeholders present at the Workshop. The following positions emerged:

Vice-President of the Order of Doctors of Agronomy and Forestry of the Province of Pescara:

The central theme of greenery: in the past, interventions in the Pescara area were made without knowing the characteristics of the plants; therefore, today we are paying the consequences. "If pines, instead of growing along the roads, had grown in a forest or a nature reserve, nature would complete its natural life cycle, letting them fall without causing injury or damage." Now, however, they must be cut down because they create problems for public safety, even if this activity is the subject of many stances taken by people who know nothing about trees. Equally, importance must be given to the theme of green management and silviculture. Full willingness expressed for future discussion.



President of the Beach Resort Operators (Balneatori):

A historic figure in Pescara tourism who actively deals with issues related to coastal erosion, the protection of establishments, and the management of beach concessions in the province. The President took a stance regarding the sector's lack of foresight in past years, the lack of a vision capable of making investments also for the safety of structures, and the need, instead, to open a dialogue table with politicians to address a series of problems and better understand the risks of the coming years.

Representative of the Order of Engineers of the Province of Pescara:

The topic addressed concerns flood risk and the new provisions of AUBAC (Central Apennine Basin District Authority) which foresee many areas as no longer buildable. There is a request to make the project well-known among their members, and they are available for joint activities to be scheduled in the coming months.

Official from the Abruzzo Region, SEA (VAS) Office:

Great interest in the Indicators provided for in the project to investigate existing risks, and a call for urban planning that uses indicators to understand and solve problems. The lack of data is recognized as one of the major critical issues of the Abruzzo Region, along with an invitation to form a common front to try to solve this problem.

The workshop concluded with an exhibition organized by students from the School of Architecture and Design on design proposals for the Pescara area to counteract the impacts of climate change, as an activity to be placed within Activity WP2 | Lifelong Learning for climate transition. A 2.2 | Information exchange and delivery through trainings and lifelong-learning courses.

5.CONCLUSIONS

The territory comprising Pescara, Montesilvano, and Spoltore—soon to be consolidated into "Nuova Pescara"—is currently facing a systemic crisis defined as a "Climate Hotspot." The area is characterized by excessive soil sealing, with over 52% of Pescara being impermeable, which, combined with rapid climate tropicalization, has created a fragile ecosystem. Data from 1991–2024 reveals a 1.4°C rise in average



temperatures, a 425% increase in "tropical nights," and a 230% rise in extreme rainfall events. This clash between rigid urban infrastructure and a changing climate has turned exceptional weather events into structural economic variables. This situation has led to a "multilevel vulnerability" affecting every strategic sector of the local economy. The **Blue Economy** faced a critical year in 2024, where marine heatwaves combined with mucilage outbreaks caused mussel mortality rates between 80% and 100%, necessitating a shift toward offshore farming. Similarly, the **Green Economy** is suffering from a "tropicalized" regime; winter droughts and extreme rains caused devastating losses in the 2024 harvest for wine, olive oil, and hay, further aggravated by saltwater intrusion. The **Tourism** sector is trapped in a "Rain-Ban" cycle, where intense rainfall overwhelms the sewer system, leading to discharges that cause bathing bans, while extreme heat reduces daytime revenue. Furthermore, the **Urban System and Industry** face dual risks of flooding and landslides, with the industrial sector suffering from machinery damage and operational downtimes, leading to a significant rise in insurance premiums. Finally, **Biodiversity** is degrading due to invasive species and the fragmentation of river corridors. To address these challenges, a Workshop was held on February 24th at the Aurum in Pescara to validate this knowledge framework and discuss solutions with local stakeholders. During the event, UNICAM presented a strategic vision for **Nuova Pescara 2027**, proposing a radical shift in territorial planning based on three key axes. The first is **Infrastructural Adaptation** (the "Sponge City"), which involves systematic de-paving and creating sustainable drainage systems. The second focuses on **Innovation and Nature**, promoting urban forestry to combat heat islands and transforming river management from rigid defenses to "controlled lamination" parks. The third axis addresses **Governance and Incentives**, introducing a "Resilience Rating" to provide fiscal benefits for private entities investing in Nature-Based Solutions. Following the presentation, a debate ensued with key local actors. The **Vice-President of the Order of Agronomists** criticized past urban greening choices, calling for a scientific approach to silviculture to ensure public safety. The **President of the Beach Operators** acknowledged the sector's lack of foresight in the past, emphasizing the urgent need for a political dialogue to address coastal erosion. The **Order of Engineers** raised concerns regarding new regulations that classify many areas as non-buildable due to flood risks, while a **Region Abruzzo Official** highlighted that the lack of data is a major critical issue, showing great interest in the project's indicators. The report concludes that environmental resilience is no longer just an ecological goal but a prerequisite for economic stability. Only a city capable of absorbing water and mitigating heat will remain insurable and competitive. The workshop ended with an



exhibition of student design proposals for climate adaptation, integrated into the project's Lifelong Learning activities.

ANNEX

Agenda:

Progetto INTERREG ITALIA CROAZIA “CLIMATE RESILIENT COASTAL PLANNING IN ADRIATIC- CRESCO Adria – Area Pilota "Nuova Pescara". Workshop di Co-progettazione e MOSTRA

Pescara 24 febbraio 2026- Sala Tosti- AURUM ore 10:30-12:30

AGENDA

- 10:30- 10: 40 Introduzione al Progetto Interreg Italia Croazia CRESCO Adria**
- 10:40- 11:00 L’area della Nuova Pescara e i rischi climatici ed ambientali**
- 11:00- 11:20 Possibili risposte operative**
- 11:20-12:30 Confronto con gli Stakeholders**
- 12:30 Apertura Mostra: I Lavori del Corso di Pianificazione della Città e del
Paesaggio A e B- Laurea Magistrale in Architettura. Scuola di
Architettura e Design- Università di Camerino**



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Presentation n.1 Some slides

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CRESCO Adria

Climate RESiliEnt COastal planning in Adriatic

A1.3 Spatial climate change database (web based
visualization and spatial resilience indicators)

A3.3 Survey in pilot areas

Antonio Bocca

Assegnista di ricerca

Scuola di Architettura e Design "E. Vittoria"
Università di Camerino

CRESCO Adria Climate RESiliEnt COastal planning in Adriatic I casi pilota

Town of Crikvenica
(Croatia)



Municipality of Sali
(Croatia)



Nuova Pescara
(Italy)



Pineto
(Italy)



Pescara, 24 febbraio 2026

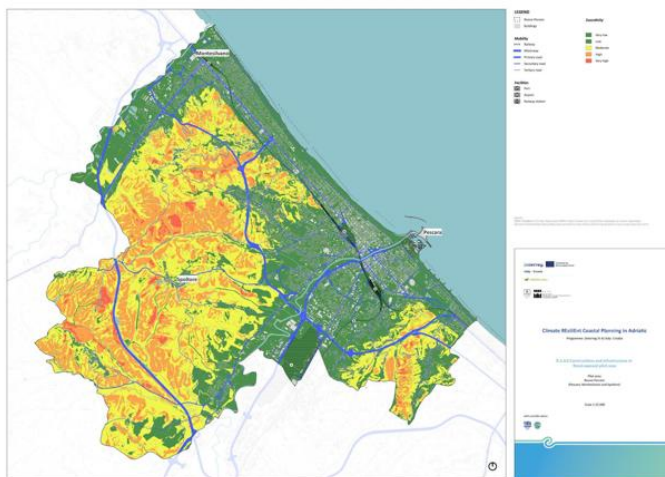
CRESCO Adria Climate RESiliEnt COastal planning in Adriatic

D 1.4.1 Landslide susceptibility maps

Partner Progetto Interreg



Consulenza
scientifica



Pescara, 24 febbraio 2026

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D 1.4.2 Inventory of landslides

Partner Progetto Interreg



Consulenza
scientifica



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CRESCO Adria Climate RESiliEnt COastal planning in Adriatic

D 1.4.3 Vulnerability assessment of the coastal area to erosion, sea level rise, extreme hydrometeorological events analysis

Partner Progetto Interreg



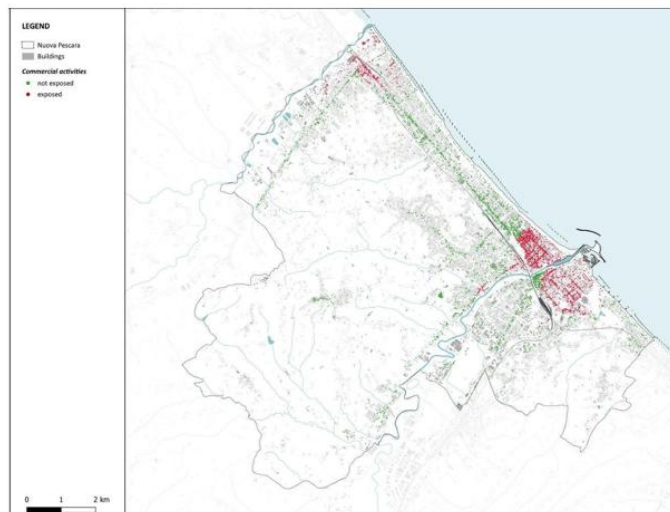
Consulenza
scientifica



Pescara, 24 febbraio 2026

Identificazione attività commerciali
esposte e non esposte a frane e
alluvioni

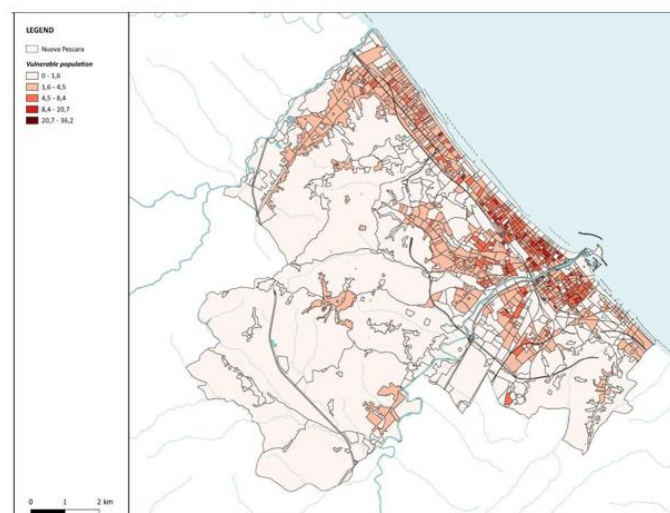
CATCHING THE WAVES
OF COOPERATION



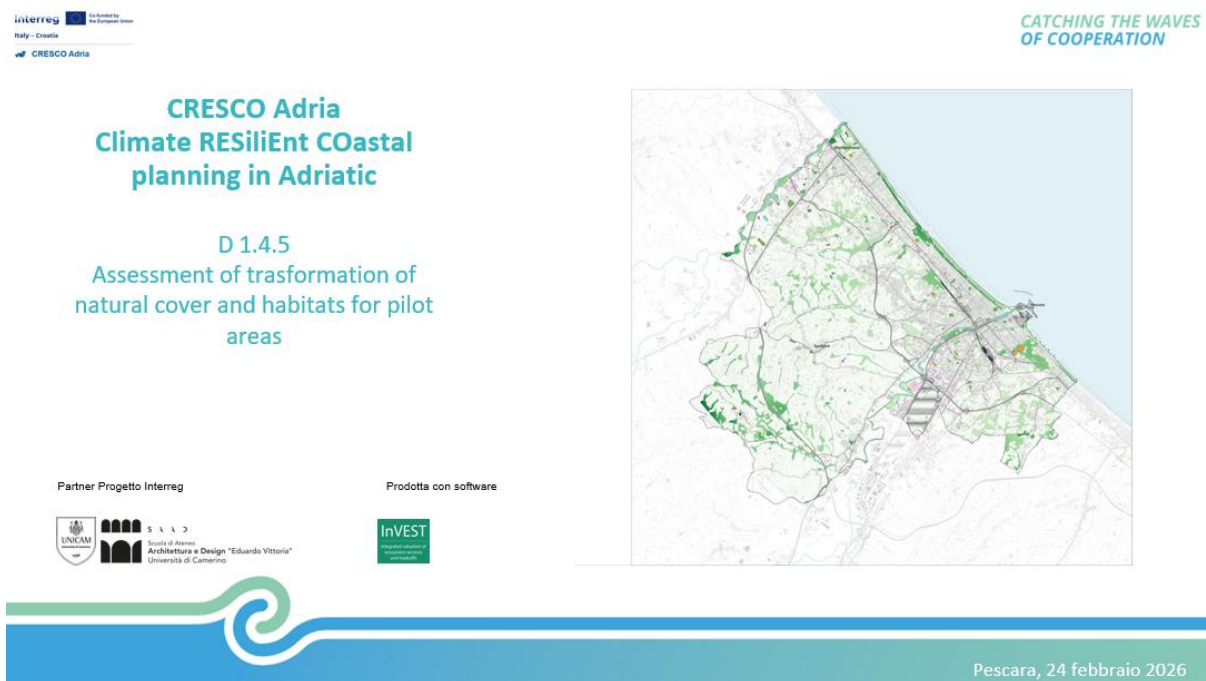
Pescara, 24 febbraio 2026

Popolazione fragile

CATCHING THE WAVES
OF COOPERATION



Pescara, 24 febbraio 2026



CRESCO Adria
Climate RESilient COastal
planning in Adriatic

D 1.4.6
Constructions and infrastructure in
flood exposed pilot areas, roads,
port, water infrastructure reports

Partner Progetto Interreg

*CATCHING THE WAVES
OF COOPERATION*

Pescara, 24 febbraio 2026

DEFINIZIONE INDICATORI

- D1.4.1 Landslide susceptibility maps
- D1.4.2. Inventory of landslides
- D1.4.3 Vulnerability assessment of the coastal area to erosion, sea level rise, extreme hydrometeorological events analysis
- D1.4.4. Distribution of flooding areas
- D1.4.5. Assessment of transformation of natural cover and habitats for pilot areas

Quali indicatori?

- **16 indicatori**
- **3 indicatori ausiliari**

Pescara, 24 febbraio 2026


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CATCHING THE WAVES
 OF COOPERATION

1	People living, properties in flood prone areas (P3)	Number of people living in P3 areas and % relative to the municipal population	9	Educational facilities in flood-prone areas	Number of educational facilities
2	People living in landslides areas (P3+P4)	Number of people living in P3 and P4 areas and % relative to the municipal population	10	Educational facilities in landslide areas	Number of educational facilities
3	Critical infrastructures in flood-prone areas	Linear meters of public roads (highways, state, regional and local roads)	11	Public safety buildings in flood-prone areas	Number of public safety buildings
4	Critical infrastructures in landslide areas	Linear meters of public roads (highways, state, regional and local roads)	12	Public safety buildings in landslide areas	Number of public safety buildings
5	Buildings in flood-prone areas	Number of buildings	13	Cultural heritage in flood-prone areas	Number or area of cultural heritages
6	Buildings in landslide areas	Number of buildings	14	Cultural heritage in landslide areas	Number or area of cultural heritages
7	Sport facilities in flood-prone areas	Number of sport facilities	15	Electrical infrastructure in flood-prone areas	Linear meters of electrical infrastructure
8	Sport facilities in landslide areas	Number of sport facilities	16	Electrical infrastructure in landslide areas	Linear meters of electrical infrastructure

Pescara, 24 febbraio 2026

Pescara, 24 febbraio 2026

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CATCHING THE WAVES
OF COOPERATION

1	Total population	Number of people living in municipality
2	Total number of buildings	Number of buildings in municipality
3	Total length of public roads	Linear meters of public roads in municipality

Pescara, 24 febbraio 2026

Pescara, 24 febbraio 2026

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Climate RESiliEnt COastal planning in Adriatic

A1.3 Spatial climate change database (web based
visualization and spatial resilience indicators)
A3.3 Survey in pilot areas

Name: Rosalba D'Onofrio
Institution: University of Camerino

Title: **NUOVA PESCARA PILOT AREA**



L'area metropolitana di Pescara, Montesilvano e Spoltore è stata selezionata come Area Pilota perché rappresenta un "Hotspot Climatico": un territorio dove la densità urbana e produttiva si scontra con l'accelerazione dei fenomeni meteorologici estremi

Indicatore	Media 1991–2020	2023–2024	Variazione
Temperatura media annua	14,8°C	16,2°C	+1,4°C
Giorni >35°C	6/anno	18/anno	+200%
Notti tropicali (>25°C)	4/anno	21/anno	+425%
Eventi >30 mm/h	2–3/anno	8–10/anno	+230%
SST media estiva	24,5°C	27,8–29°C	+3–4°C

Pressioni

Fattori o processi (naturali o antropici) che esercitano uno stress continuo o ricorrente su un sistema (ecosistema, settore economico, infrastruttura), alterandone l'equilibrio.

Minacce

Eventi o dinamiche potenzialmente dannose, spesso acuti o estremi, che possono generare impatti rilevanti nel breve/medio periodo.

Vulnerabilità

Grado di suscettività di un sistema agli effetti negativi delle pressioni e minacce, determinato da esposizione, sensibilità e capacità di adattamento.

Pescara 24 febbraio 2026

I Tre Pilastri della Resilienza della "Nuova Pescara"

Per garantire la continuità operativa del sistema economico e la vivibilità urbana, la strategia deve poggiare su tre pilastri fondamentali.

1. Adattamento Infrastrutturale**Non è più procrastinabile una massiccia opera di de-impermeabilizzazione.**

Pescara deve "tornare a respirare" per evitare che ogni nubifragio:

- si trasformi in danno diretto per il commercio,
- generi divieti di balneazione,
- comprometta l'immagine turistica.

Azioni chiave:

- depaving sistematico,
- sistemi di drenaggio urbano sostenibile (SUDS),
- obbligo di invarianza idraulica,
- digitalizzazione delle reti idriche (PNRR).

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2. Innovazione Tecnologica e nell'offerta

Sistemi di allerta e sistemi di monitoraggio in grado di farsi trovare preparati e diversificare l'offerta

Es. La crisi della mitilicoltura e della pesca del 2024 ha evidenziato che il mare Adriatico è mutato sotto il profilo termico ed ecologico.

Le uniche strategie di protezione degli investimenti sono:

- transizione verso acquacoltura off-shore,
- utilizzo di sistemi predittivi (Early Warning),
- monitoraggio termico e batteriologico continuo.

Il "Blue Deal" locale deve integrare innovazione tecnologica, ricerca scientifica e protezione delle filiere produttive.

3. Rigenerazione del Patrimonio Naturale

Pinete costiere, corridoi fluviali e aree umide non rappresentano semplice decoro urbano, ma infrastrutture climatiche essenziali.

La loro tutela e potenziamento costituiscono la risposta primaria a:

- Isola di Calore Urbana (UHI),
- stress termico della popolazione fragile,
- perdita di appeal turistico della costa.

La biodiversità diventa così infrastruttura economica.

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Il Ruolo Strategico dell'Urbanistica

Nel contesto della crisi climatica e della trasformazione istituzionale verso la "Nuova Pescara" 2027, l'urbanistica non è più uno strumento di mera regolazione volumetrica, ma diventa il regista della sopravvivenza territoriale.

Il suo ruolo si articola in cinque funzioni strategiche

1. Da Espansione a Rigenerazione e Sottrazione

Storicamente, l'urbanistica locale ha favorito la saturazione del suolo. Oggi deve invertire la rotta.

- Depaving pianificato: individuare dove rimuovere asfalto e cemento per restituire permeabilità.
- Recupero dei volumi esistenti: incentivare densificazione intelligente e riuso dell'esistente, evitando nuovo consumo di suolo e liberando superfici per il drenaggio.

2. Governance dell'Invarianza Idraulica

L'urbanistica deve stabilire nuove regole per gli interventi edilizi.

- Ogni progetto deve funzionare come una "micro-spugna".
- L'edificio deve trattenere e gestire una quota definita di acqua meteorica tramite:
 - tetti verdi,
 - vasche di recupero,
 - giardini drenanti.

Strade e piazze devono essere progettate come dispositivi di rallentamento delle acque meteoriche (SUDS integrati).

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3. Mitigazione dell'Isola di Calore Urbana (UHI)

L'urbanistica è lo strumento per ridurre la temperatura urbana di 3–5°C.

Azioni:

- creazione di corridoi ecologici funzionali al trasporto delle brezze marine e collinari,
- ombreggiamento continuo dei percorsi pedonali e commerciali, uso obbligatorio di materiali riflettenti ("cool") per pavimentazioni e coperture.

4. Gestione Unificata del Rischio

Con la fusione 2027, l'urbanistica ha il compito storico di redigere un Piano Urbanistico Comunale (PUC) unitario.

Obiettivi:

- superare definitivamente il conflitto monte-valle,
- introdurre una zonizzazione del rischio economico, evitando l'insediamento di attività sensibili in aree depresse o ad alta pericolosità.

5. Difesa delle Infrastrutture Critiche e Sociali

La città deve continuare a funzionare durante l'evento estremo.

Azioni prioritarie:

- messa in sicurezza dei sottopassi,
- mettere in sicurezza le infrastrutture strategiche
- progettazione di piazze multifunzionali capaci di trasformarsi temporaneamente in bacini di accumulo durante le "bombe d'acqua".
- allerta vento

CATCHING THE WAVES
OF COOPERATION



Pescara 24 febbraio 2026


Italy – Croatia
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6. Verso un Nuovo Patto con gli Stakeholder

La resilienza non è compito esclusivo dell'ente pubblico.
È necessario coinvolgere:

- commercianti,
- industriali,
- agricoltori,
- compagnie assicurative.

Obiettivi di un tavolo permanente per l'adattamento:

- mappare i "costi del non-fare",
- incentivare l'autoprotezione privata (rating di resilienza),
- costruire un brand territoriale fondato su sicurezza e sostenibilità.

CATCHING THE WAVES
OF COOPERATION



Pescara 24 febbraio 2026



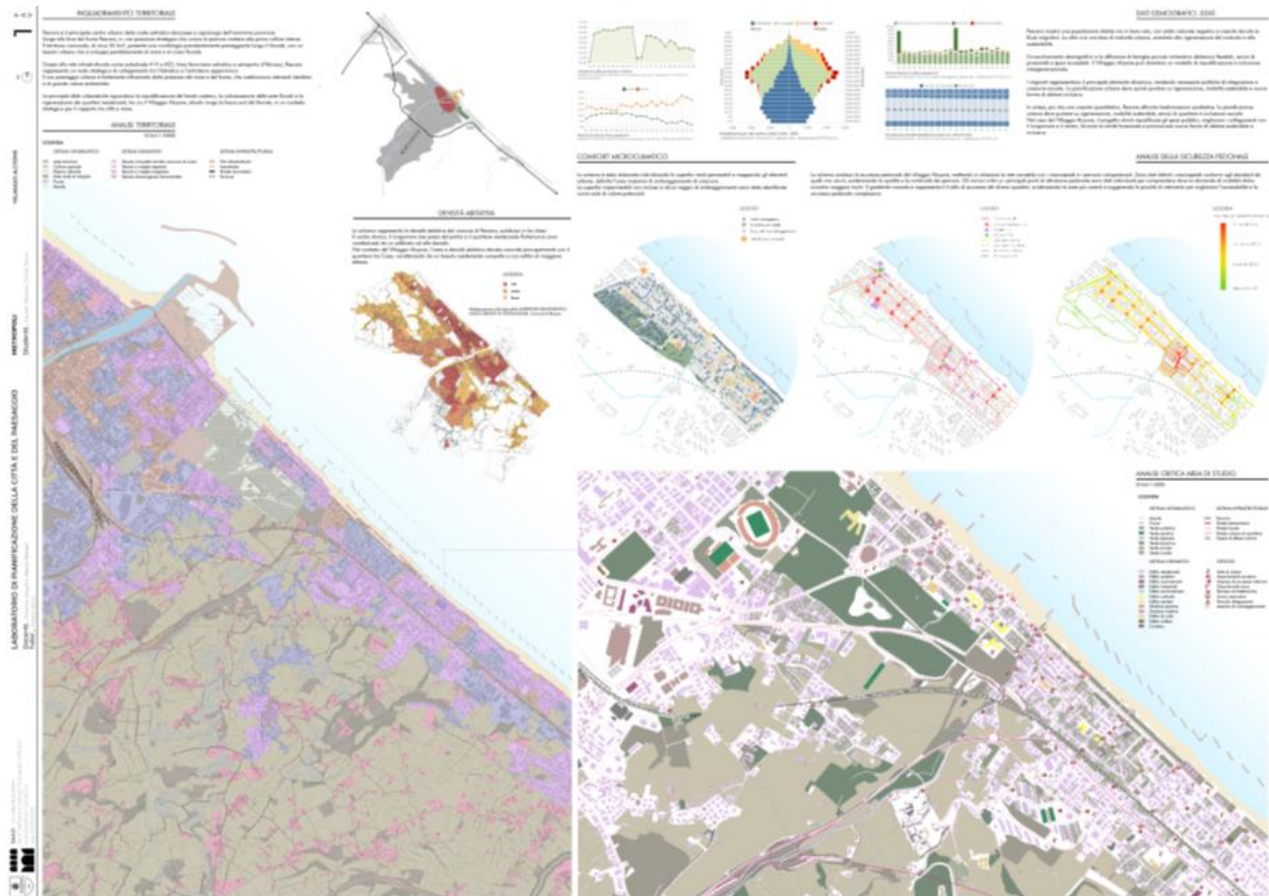
WP2. Lifelong Learning for Climate transition
A2.2 Information exchange and delivery through trainings
and lifelong –learning courses

CATCHING THE WAVES
OF COOPERATION

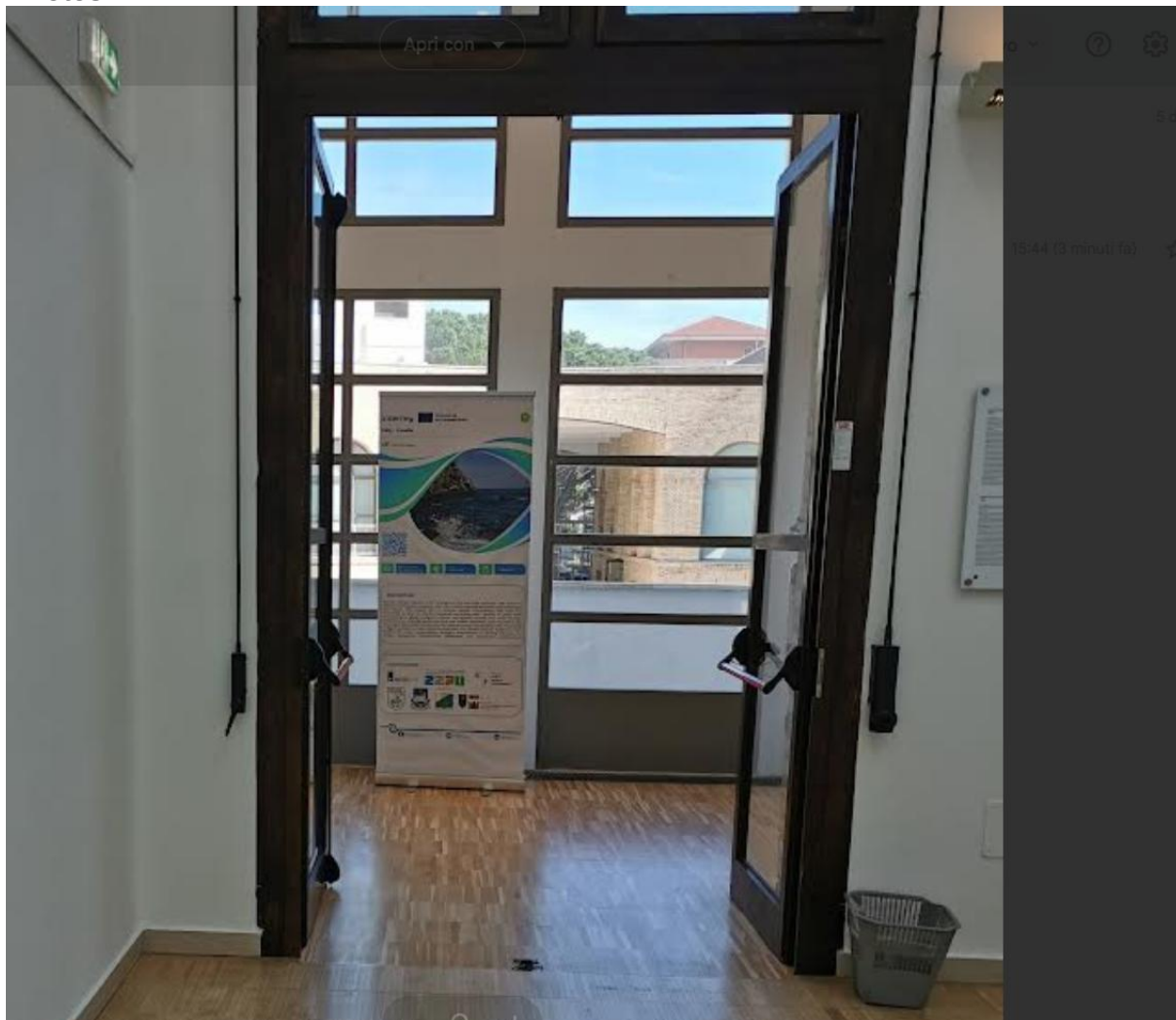
The screenshot shows a project website for CRESCO Adria. The header includes the Interreg logo, the European Union flag, and the text 'Co-funded by the European Union'. Below this, it says 'Italy – Croatia' and 'CRESCO Adria'. The main content area features a large image of a coastal landscape with waves crashing against rocks. To the left of this image is a QR code. Below the image, there are sections for 'ABOUT US' and 'CONTACT'. The 'ABOUT US' section contains text about the project's goals and objectives. The 'CONTACT' section lists various partners and stakeholders. On the right side of the website, there is a large map of the Adriatic coast, showing the coastline and various locations. The map is titled 'LABORATORIO DI MANIPOLAZIONE DELLA CITTÀ E DEL PARADISO'.

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Photos:











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LISTA PARTECIPANTI 1° WORKSHOP* WORKSHOP CON GLI
STAKEHOLDERS

CRESCO Adria
Climate RESiliEnt COastal planning in Adriatic

24 Febbraio 2026. AURUM PESCARA. Workshop con gli Stakeholders e Mostra
Attività A1.3 - A3.3-A2.2



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ALESSANDRO	COLAIUVA	REGIONE ABRUZZO	
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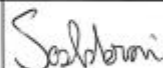
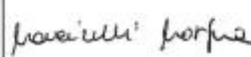
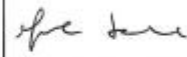
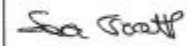
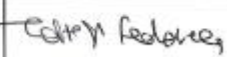
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SHEYDA ELISABETTA	PICCIONI	SAAD/UNICAM	<i>[Signature]</i>
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FEDERICA	TORRESI	SAAD UNICAM	



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MARTINA	BAFFI	SAAD/UNICAM	
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ANDREA	MASCI	COMUNE DI PESCARA	
EMANUELA	LIONETTI	COMUNE PESCARA	Elena Lionetti
MATTEO	CRISANTO	COMUNE DI PESCARA	Matteo Crisanto

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DICCA e lo padovano	Padovano	Cooperativa	Padovano



27/02/26, 16:36

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 CRESCO Adria**Luogo:**

Sala Tosti - AURUM

Data:

24 Febbraio 2026

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Aperto ora

★ Percentuale di valutazioni positive: 70% (Recensioni: 8)

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23 febbraio alle ore 15:01

Workshop e Mostra CRESCO Adria – Nuova Pescara
Pescara, 24 febbraio 2026 – Sala Tosti, AURUM... [Altro...](#)

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Progetto CRESCOAdria - Area Pilota "Nuova Pescara". Workshop di Co- progettazione e MOSTRA

1



Ora:

10:30 - 12:30

Link:**AGENDA**

- 10:30- 10:40
Introduzione al Progetto Interreg Italia Croazia CRESCO Adria
- 10:40- 11:00
L'area della Nuova Pescara e i rischi climatici ed ambientali
- 11:00- 11:20
Possibili risposte operative
- 11:20-12:30
Confronto con gli Stakeholders
- 12:30
Apertura Mostra: I Lavori del Corso di Pianificazione della Città e del Paesaggio A e B-
Laurea Magistrale in Architettura. Scuola di Architettura e Design- Università di Camerino

Allegati

-  CRESCO Adria Workshop e Mostra 24 Febbraio 2026.pdf
-  Mostra AURUM SAAD-UNICAM (3) (2).pdf



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Sant'Angelo Magno

Viale della Rimembranza n. 3, Ascoli Piceno 63100

Sede Castellano

Lungo Castellano n.36, Ascoli Piceno 63100



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