PR FESR FVG 2021–2027 PROJECT · TRL 6

acquamArIna

Intelligent marinas for healthy waters.

SUMMARY

The tourist harbour becomes intelligent.

acquamArIna is the IoT + AI platform with which Infordata Sistemi Società Benefit brings digital transformation to harbour environmental management. A mesh of multi-parameter probes in the water, a Machine Learning model for parameters that cannot be measured in real time, an operator console for harbour staff, and a public-facing dashboard for citizens and authorities — all co-funded by the Friuli Venezia Giulia region via the PR FESR 2021–2027 grant, action a1.3.1.

> *TRL 6 demo site: Trieste marina, Strada per Vienna 55/1. 8 active probes · 19 parameters · 90+ days of processed historical telemetry.*

THE PROBLEM

From episodic sampling to continuous monitoring.

Harbour water quality is still mostly checked with manual sampling and weekly lab analyses. Between measurements, operators are blind. An oil sheen detected in 12 minutes rather than 12 hours can be the difference between a managed event and an environmental incident.

acquamArIna closes the loop: continuous measurement, ML estimation of parameters you can't sense in real time, instant alerting for operators and citizens, and a recommended response procedure for every alarm.

WHO IT SERVES

Three segments, one platform.

⚓ Tourist marinas

Blue Flag, environmental certifications, reputation. An ignored oil sheen is tomorrow's headline. acquamArIna delivers permanent probes, AI insights and a public dashboard as continuous proof of transparency.

▯ Public authorities

Bathing Water Directive 2006/7/EC, EU Marine Strategy, environmental agency reporting. Need continuous, auditable data. acquamArIna publishes CC BY 4.0 open data, KPI snapshots with explicit methodology, history endpoint, embed widgets for municipal portals.

▯ Industrial water-treatment sites

Discharge to receiving water body, BOD/COD/metals threshold compliance, environmental permit (AIA). Monthly grab samples are not enough. acquamArIna monitors continuously in and out, runs anomaly detection on flows, models filters and membranes as Asset Digital Twins and triggers predictive maintenance.

THE PLATFORM

Three surfaces, one source of truth.

Operator console

Live marina geomap with sensor placement, parameter grid with tolerance bands, AI insight feed, alarm timeline, maintenance backlog auto-generated from inefficiency indicators. Every alarm ships with a wired-in response procedure linked to the ticketing system.

Public dashboard

WQI 0–100 based on the CCME formula, bathing risk, SDG mapping, marina ESG score. WCAG 2.2 AA. Three modes: web, kiosk (dockside totems), embed (iframe widgets for institutional portals).

Open API

OpenAPI 3.1, licensed under CC BY 4.0. CORS-open /v2/public/* endpoints for locations, KPI snapshots, history time-series, public events, methodology and citizen reports.

Citizen reporting

Citizens flag oil sheens, wildlife in distress or visual anomalies through a public form. Honeypot, per-IP rate limit, automatic EXIF strip of uploaded photos. Reports feed the staff moderation queue.

Predictive maintenance

Asset Digital Twin for filters, membranes, reactors and pumps. Clogging probability, fouling, anomaly score. Auto-generates maintenance tasks tied to the ticketing system.

Lab integration

Lab Sample / Lab Result module with chain-of-custody, AI cross-check between lab data and telemetry, virtual calibration of the ML models.

PARAMETERS

Eight probes, nineteen indicators.

Parameters measured directly by DISEN-Sensor / Lohand probes feed the operator console in real time. Virtual parameters are estimated by the ML model, paired with lab samples.

Parameter	Type	Sensor / source	Regulatory reference
pH	Measured	DISEN DS510	D.Lgs. 152/2006 Tab. 1B (6.5–8.5)
ORP	Measured	DISEN DS525	—
Conductivity	Measured	DISEN DS480	Operator (≤ 55 mS/cm)
Turbidity	Measured	DISEN DSS410	D.Lgs. 152/2006 Tab. 1B (≤ 5 NTU)
Oil-in-water	Measured	DISEN DS530	D.Lgs. 152/2006 Tab. 1B (≤ 1.0 mg/L)
PAH	Measured	DISEN DS810	Dir. 2008/105/EC
Nitrates	Measured	DISEN DSX260	D.Lgs. 152/2006
Chlorophyll	Measured	DISEN optical	—
COD · BOD · TSS	Virtual (ML)	ML model + LH-DC18	D.Lgs. 152/2006
Pb · Cd · Hg · Cu	Virtual (ML)	ML model + lab	Dir. 2008/105/EC · MARPOL
Zn · Ni · As · Cr	Virtual (ML)	ML model + lab	Dir. 2008/105/EC · MARPOL

TECHNOLOGY

Open source, EU-hosted, audit-ready.

No proprietary lock-in. No Google Maps, no Mapbox, no non-EU cloud. The platform runs on a single docker-compose host or a Swarm stack.

Layer	Technology
Backend	PHP 8.3 + Yii2 advanced (api/ · backend/ · common/ · console/ tiers)
Database	MariaDB 10, partitioned deployed_sensor_data
Queue	yiisoft/yii2-queue + AMQP → RabbitMQ
MQTT	Mosquitto + php-mqtt/client
AI	openai-php/client for insight feed + i18n
Formulas	nxp/math-executor (Parameter.formula)
Frontend	Yii2 PHP views, vanilla JS, ApexCharts
Maps	Leaflet + OpenStreetMap (OSS-only)
Telemetry	OpenTelemetry → Tempo · Loki · Prometheus · Grafana
ML	Python ML scaffold, FastAPI prediction service
Deploy	Single-host docker-compose · Swarmpit stack

SUPPORTED SENSORS

Tested hardware, plug-and-play integration.

We work with two validated suppliers covering the full spectrum of marine and industrial parameters. The driver layer is abstracted: adding a new model means a channel map, not a rewrite.

DISEN-Sensor — Xi'an Desun Uniwill

Catalogue focused on online continuous measurement, with a dedicated marine line (including EGCS scrubber wash-water systems). Catalogue: https://disen-sensor.com/product-center/

Lohand Biological

Lab and portable line, useful for grab-sample validation and ML model calibration. Catalogue: https://www.lohandbio.com/water-quality-test-equipment/

LIVE DEMO

Trieste marina — Strada per Vienna 55/1

TRL 6 demo site since 2026. 8 active probes, over 90 days of historical telemetry processed.

Reference KPIs: average WQI 82/100 · average discharge 147 m^3/day · ESG score B+ · 30-day WQI trend +1.2 · ~12 events per day.

CONTACT

Let's talk.

To arrange a live demo at our Trieste site, or to scope a deployment for your harbour or facility:

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> *Infordata Sistemi S.r.l. Società Benefit · VAT IT00933570327 · ISO 9001:2015 · ISO/IEC 27001:2024 · ACN qualified for cloud services · Grade-B ESG rating · listed on the Italian Public Administration e-marketplace.*