

Product Requirements Document — Madrid O₃ Information Threshold Demo (MLP)

1) Purpose

Deliver a public, self-serve demo that shows when the ozone information threshold is exceeded in the Madrid agglomeration, and renders an Annex style notice instantly. It proves correctness, speed, and reliability without needing prior buy-in from the authority.

2) Goals

- Detect $O_3 \geq 180 \mu\text{g}/\text{m}^3$ (1 hour) using official station data.
- Present a clear status and a ready-to-publish notice in Spanish.
- Provide trust cues: timestamps, data freshness, change log.
- Keep scope tiny and lovable. No accounts. No outreach dependencies.

3) Users and Jobs

Primary user: duty staff in the municipal/regional air quality team.

Job: see status at a glance, copy a correct notice fast, trust the numbers.

4) Regulatory anchor

EU Directive (EU) 2024/2881, Annex I Section 4: O_3 information threshold = $180 \mu\text{g}/\text{m}^3$ (1 h).

5) Data Scope

- Area: Aglomeración de Madrid
- Pollutant: O_3 only
- Granularity: hourly values from fixed monitoring stations
- Units: $\mu\text{g}/\text{m}^3$
- Time: last complete hour (UTC)

6) Outputs

/madrid page – badge, “Por qué”, Annex style notice, station table, change log, freshness banner.

/madrid/status.json – machine-readable status, maxima, trigger station, data age, PDF link.

/madrid/latest.pdf – press-ready A4 mirror of the notice.

/madrid/methodology – sources, threshold rule, scope, caveats, attribution.

7) Status Logic

If any representative station $\geq 180 \mu\text{g}/\text{m}^3 \rightarrow$ INFO_EXCEEDED. Else COMPLIANT.

Debounce: two consecutive pulls required to change state.

Recovery: two consecutive hours $< 180 \mu\text{g}/\text{m}^3 \rightarrow$ COMPLIANT.

Freeze state if data_age_minutes > 90.

Computed fields: episode start, duration, highest 1 h and 8 h means, station table, placeholder forecast.

8) UX

Spanish labels, Europe/Madrid times, aligned numbers, visible “Por qué”, data age badge, change log, copy HTML + PDF buttons, accessibility labels.

9) Notice Content (Spanish)

Área – Aglomeración de Madrid

Tipo – Umbral de información O_3 ($180 \mu\text{g}/\text{m}^3$, 1 h)

Inicio y duración – {inicio_local}, {duración_horas}

Valor máx 1 h – {valor} $\mu\text{g}/\text{m}^3$ en {estación}, {hora_local}

Media máx 8 h – {valor_8h} $\mu\text{g}/\text{m}^3$

Pronóstico breve – texto estático

Tabla de estaciones – {ID, nombre, valor, hora}

Pie – vista previa no oficial + unidades.

10) Data Acquisition Summary

Sources: EEA Air Quality Download Service (E2a Up■To■Date) and EEA Zones dataset.

Filter: Country=ES, City=Madrid, Pollutant=O3, Aggregation=hour, last 48 h.

Evaluate the latest complete hour; if any station $\geq 180 \mu\text{g}/\text{m}^3 \rightarrow \text{INFO_EXCEEDED}$.

Debounce + freeze on stale data > 90 min.

11) Validation Checklist

- Synthetic $185 \mu\text{g}/\text{m}^3$ test flips status after two pulls.
- State returns to COMPLIANT after two hours < 180.
- Data■age banner appears when > 90 min.
- Change log records every flip.

12) Architecture (high■level)

Ingest \rightarrow Process \rightarrow Render \rightarrow Publish \rightarrow Store 7–30 days of data + logs.

13) Acceptance Criteria

- Correct threshold detection.
- Notice fields render in Spanish.
- PDF timestamped and matching HTML.
- Explicit disclaimer on every page.

14) Data Retrieval Addendum

- 1 – Identify zone (AQ Zones dataset \rightarrow Aglomeración de Madrid polygon).
- 2 – Download EEA E2a Up■To■Date hourly O■ for Madrid (last 48 h). ZIP of Parquet files.
- 3 – Unpack, confirm units $\mu\text{g}/\text{m}^3$ and timestamps UTC.
- 4 – Compute latest complete hour, apply threshold logic.
- 5 – Generate status.json and notice page.

Guardrails – coverage ≥ 2 stations, freeze if stale, log corrections.

15) Future Toggles

O■ alert + 3 h rule \rightarrow CAP feed \rightarrow approval toggle \rightarrow Sentinel■4 context \rightarrow NO■.

This single document defines all goals, logic, and data handling for the Madrid ozone information■threshold demo. It should be followed exactly when building the first public prototype.