

# Should I use the car tomorrow?

## PREDICTING POLLUTION WITH OPEN DATA

PiperLab



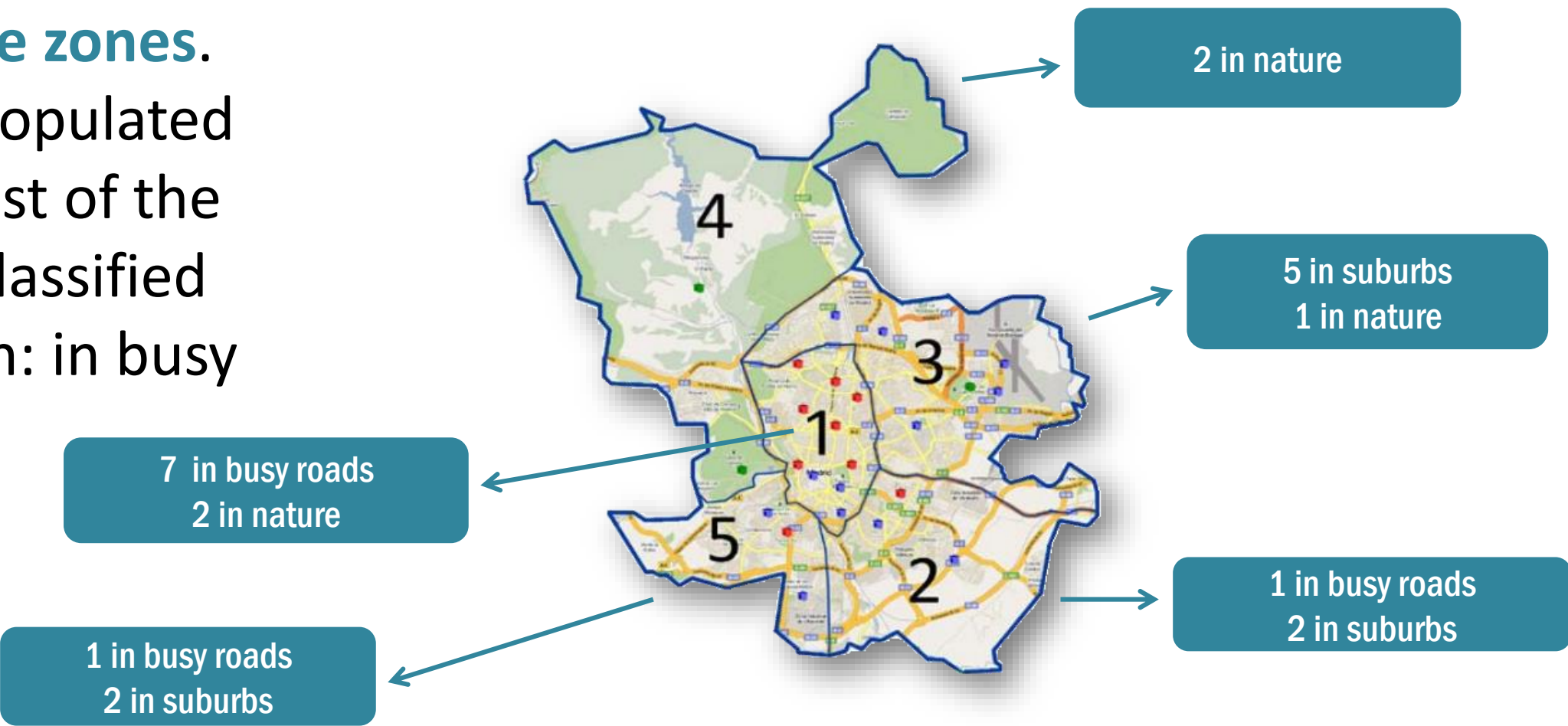
### AIR POLLUTION OPEN DATA

Madrid has **24 measuring stations** that collect **hourly data** about different air pollutants:

- NO<sub>2</sub>
- O<sub>3</sub>
- PM2.5
- PM10
- SO<sub>2</sub>
- CO
- ...



The city is divided into **five zones**. Zone 1 (central) is more populated and, therefore, where most of the stations lie. Stations are classified depending on the location: in busy roads, suburbs or nature.



Each hour, a **raw file** with the measures is made publicly available in the City of Madrid's Data Portal:

[datos.madrid.es](https://datos.madrid.es)



### WHY IS IT SO USEFUL?

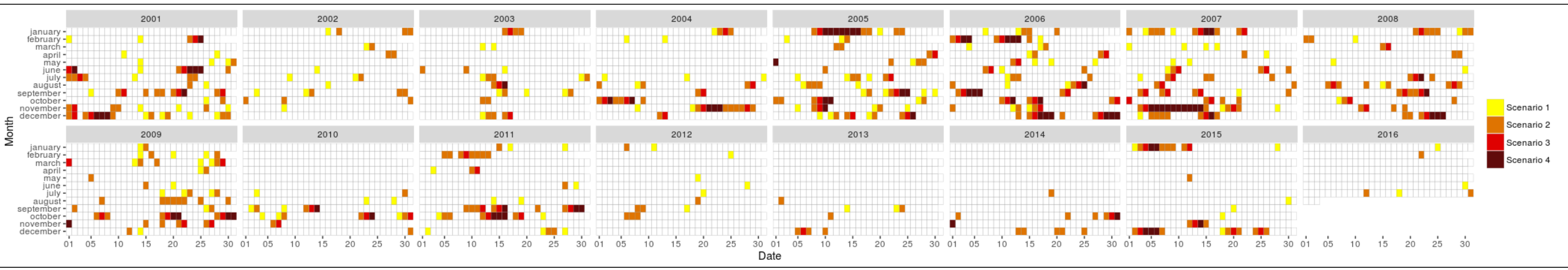


Madrid has a **Protocol for High Pollution Episodes** that might be activated when NO<sub>2</sub> levels exceed certain limits. Different scenarios of traffic restrictions apply depending on the severity.

Conditions for activation are a bit complex: When daily measures in a zone reach a certain level, an **action level** is set for that day. If this happens for one or more consecutive days, an **scenario** is activated. Restrictions bound to that scenario are applied after two days.

|               |                        |   |
|---------------|------------------------|---|
| Action levels | Forewarning (preaviso) | Any 2 stations in a zone reach 180 µg/m³ for 2 consecutive hours. |
|               | Warning (aviso)        | Any 2 stations in a zone reach 200 µg/m³ for 2 consecutive hours. |
|               | Alert (alerta)         | Any 3 stations in a zone reach 400 µg/m³ for 3 consecutive hours. |

|           |            |  |
|-----------|------------|--|
| Scenarios | Scenario 1 | 1 forewarning ⇒ 70 km/h speed in M-30 and accesses.  |
|           | Scenario 2 | 2 forewarnings or 1 warning ⇒ previous + parking forbidden in SER zone to all non-residents. |
|           | Scenario 3 | 2 warnings ⇒ previous + only 50% of cars in the city center.                                 |
|           | Scenario 4 | 3 Warnings or 1 alert ⇒ previous + only 50% of cars in M-30.                                 |



The first protocol was designed in March 2015 and then modified in February 2016, resulting in the version explained above.

The image on the left shows when scenarios would have been activated in case the current protocol had been in force since 2001.

**Problem:** highest levels of NO<sub>2</sub> usually occur **at night**, and rule processing isn't quick enough, so restrictions are notified when many people are already sleeping.

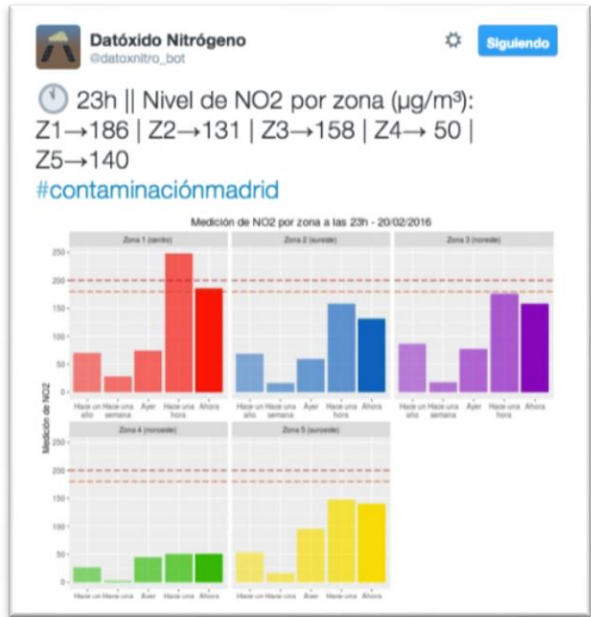
### OUR FIRST TOOL: TWITTER BOT

[@datoxnitro\\_bot](https://twitter.com/datoxnitro_bot)

**GOAL: MAKE INFORMATION -AND NOT JUST DATA- ACCESIBLE TO EVERYONE IN REAL TIME**



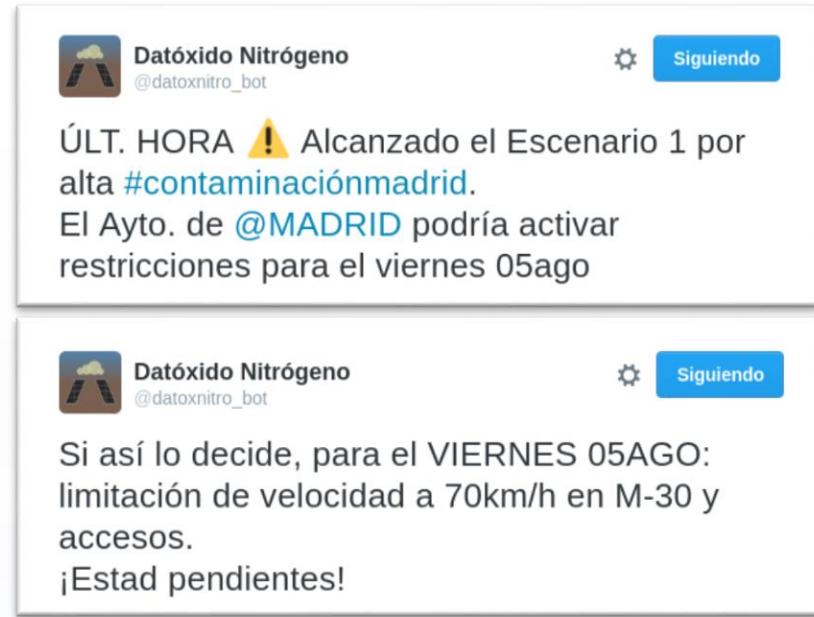
**@datoxnitro\_bot** downloads and processes the air pollution open data and posts tweets explaining the **current situation**. If pollution raises and an scenario is activated, it **immediately warns all its followers**.



NO<sub>2</sub> level by zone (hourly info)



Pollution evolution in the last 4 days (twice a day)



Scenario activation warning and restrictions info

### NEXT STEPS: PREDICTING AIR POLLUTION

**GOAL: ANTICIPATE SCENARIOS SO CITIZENS AND ADMINISTRATIONS CAN BE PREPARED FOR RESTRICTIONS**

Statistical and computational methods can be used to get a **pollution forecast** for several days ahead. Both citizens and administrations would benefit by having more time to react to these scenarios. This would help reduce incidents and encourage the use of public transport.

