Supplementary materials

In table S1 are reported all the variables used to build the model. Initially, the features used were 67, including the 4 labels. After the pre-processing, the remaining features, in total, were 32.

Feature	Source	Spatial resolution	Time period	Type	Feature name
Municipality	ISTAT	Municipal	2011	Census	Municipality
Region	ISTAT	Municipal	2011	Census	cod_reg
Control unit	ARPA	Municipal	2019-2022	Ground Pollution	Control_unit
Mean Longitude	ISTAT	Municipal	2011	Census	mean_longitude
Standard deviation Longitude	ISTAT	Municipal	2011	Census	sd_longitude
Mean Latitude	ISTAT	Municipal	2011	Census	mean_latitude
Standard deviation Latitude	ISTAT	Municipal	2011	Census	sd_latitude
Municipality Perimeter	ISTAT	Municipal	2011	Census	municipality_perimeter
Municipality Area	ISTAT	Municipal	2011	Census	municipality_area
Mean height	ISTAT	Municipal	2011	Census	mean_height
Max height	ISTAT	Municipal	2011	Census	max_height
Min height	ISTAT	Municipal	2011	Census	min_height
Standard deviation height	ISTAT	Municipal	2011	Census	sd_height
Difference of max and min height	ISTAT	Municipal	2011	Census	diff_height
Median height	ISTAT	Municipal	2011	Census	median_height
Height of the center	ISTAT	Municipal	2011	Census	center_height
Altimetric zone	ISTAT	Municipal	2011	Census	altimetric_zone
Coastal areas	ISTAT	Municipal	2011	Census	coastal_areas
Island Municipality	ISTAT	Municipal	2011	Census	island_mucipality
Coastal Municipality	ISTAT	Municipal	2011	Census	coastal_municipality
Urbanization level	ISTAT	Municipal	2011	Census	urbanization_level
Total population	ISTAT	Municipal	2011	Census	Population
Population density	Computed	Municipal	2011	Census	population_density

Male Population	ISTAT	Municipal	2011	Census	male_pop
Female Population	ISTAT	Municipal	2011	Census	female_pop
Foreign Population	ISTAT	Municipal	2011	Census	foreign_pop
Illiterate Population	ISTAT	Municipal	2011	Census	illiterate_pop
Non graduated Population	ISTAT	Municipal	2011	Census	no_grad_pop
Total Roads length	ISTAT	Municipal	2011	Census	roads_tot
Roads Density	Computed	Municipal	2011	Census	roads_density
Homes occupied	ISTAT	Municipal	2011	Census	homes_occ
Homes empty	ISTAT	Municipal	2011	Census	homes_emp
Total Buildings	ISTAT	Municipal	2011	Census	buildings_tot
Residential Buildings	ISTAT	Municipal	2011	Census	buildings_res
Commercial Buildings	ISTAT	Municipal	2011	Census	buildings_comm
Building density	Computed	Municipal	2011	Census	buildings_density
Number of Families	ISTAT	Municipal	2011	Census	families
Total Workers	ISTAT	Municipal	2011	Census	workers
Employed workers	ISTAT	Municipal	2011	Census	workers_emp
Other type of workers	ISTAT	Municipal	2011	Census	workers_oth
Volunteers	ISTAT	Municipal	2011	Census	workers_volunteers
Year			2019-2022	Time	Year
Sine of the encoded month	Computed		2019-2022	Time	Sin.month
Cosine of the encoded month	Computed		2019-2022	Time	Cos.month
Sine of the encoded day of week	Computed		2019-2022	Time	Sin.day
Cosine of the encoded day of week	Computed		2019-2022	Time	Cos.day
Ground density of NO2	ARPA	Pointwise	2019-2022	Label	NO2.y
Ground density of O3	ARPA	Pointwise	2019-2022	Label	O3.y

Ground density of PM2.5	ARPA	Pointwise	2019-2022	Label	PM2.5.y
Ground density of PM10	ARPA	Pointwise	2019-2022	Label	PM10.y
Satellite NO2	Copernicus Sentinel-5P	1113.2 meters	2019-2022	Satellite pollution	NO2.satellite
Satellite O3	Copernicus Sentinel-5P	1113.2 meters	2019-2022	Satellite pollution	O3.satellite
Aerosol Absorbing Index	Copernicus Sentinel-5P	1113.2 meters	2019-2022	Satellite pollution	AAI
Temperature	ERA-5	27830 meters	2019-2022	Global reanalysis	Temperature
Pressure surface	ERA-5	27830 meters	2019-2022	Global Reanalysis	Pressure
U component of wind at 10 meters (from East to West axis)	ERA-5	27830 meters	2019-2022	Global Reanalysis	wind_u_component
V component of wind at 10 meters (from South to Nord axis)	ERA-5	27830 meters	2019-2022	Global Reanalysis	wind_v_component
Wind speed	Computed	27830 meters	2019-2022	Global Reanalysis	wind_speed
Total precipitation	ERA-5	27830 meters	2019-2022	Global Reanalysis	Precipitation

Table S1. **Features table**. All the features used to build the Machine Learning model. The green features are the ones selected after the pre-processing phase.

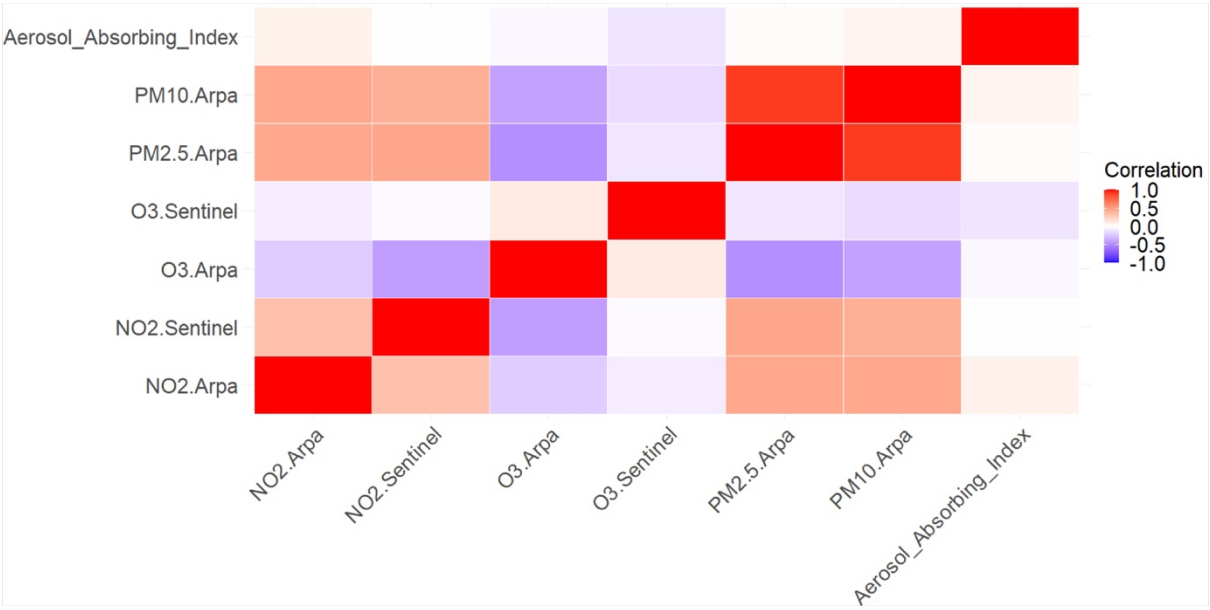

Figure S1. **Correlation matrix**. Correlation matrix of the concentration of air pollutants.