

Statistical analysis of particulate matter pollution in Talcahuano, Chile

OBJECTIVE

Analyze the data obtained from SINCA about the pollution in Talcahuano, specifically in San Vicente Station (ESV).

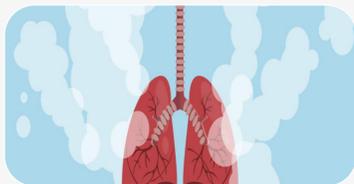
Historic Context

Talcahuano is one of the communes of the province of Concepción, located 500 km south of Santiago, Chile. Since 1950 Talcahuano had an important industrial, fishing, military and port growth, that later generated an urban growth. The environmental pollution it is affecting their natural resources, the quality of life and risking their economic development.

Summary

The levels of atmospheric pollution in Talcahuano have increased in recent years. This is dangerous for the health of the habitants, especially the damage caused by particular matter (PM) 2,5.

Introduction



The industrial activities and the increase in population have had a negative impact on the environmental situation in Talcahuano. Also, in 2015 Talcahuano was declared as a saturated zone. If the concentrations of PM 2,5 are high, it can generate cardiovascular and respiratory diseases. It is important to be aware of this problem because respiratory diseases are the third cause of death in Chile.

Methodology

Information was collected from SINCA and MeteoRed

Descriptive statistic was applied in order to know the behavior of the concentrations of particulate matter in the population.

The years 2015 and 2017 were analyzed.

The program R Statistical Software was used to make a statistical analysis.

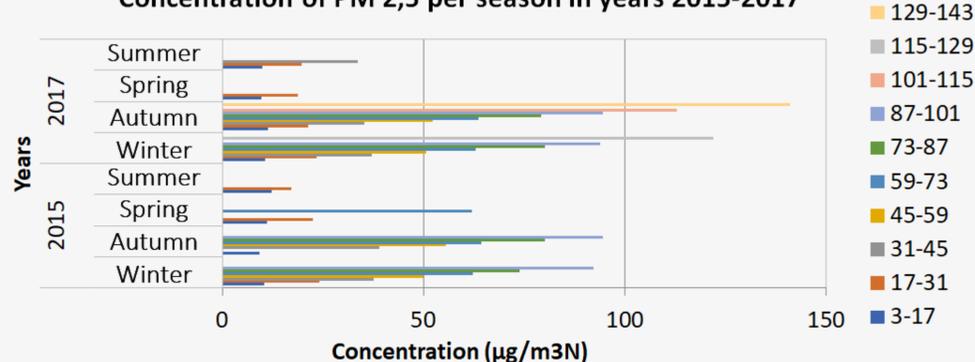
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Development and Results

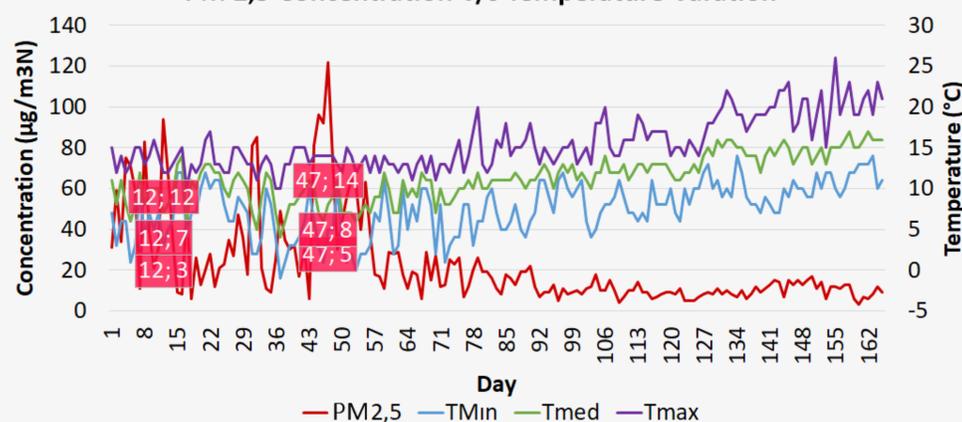
Considering that high concentrations cause cardiovascular and respiratory diseases, it is necessary to study at what seasons they occur and, in this way, find variables that are related to their variability.

Concentration of PM 2,5 per season in years 2015-2017

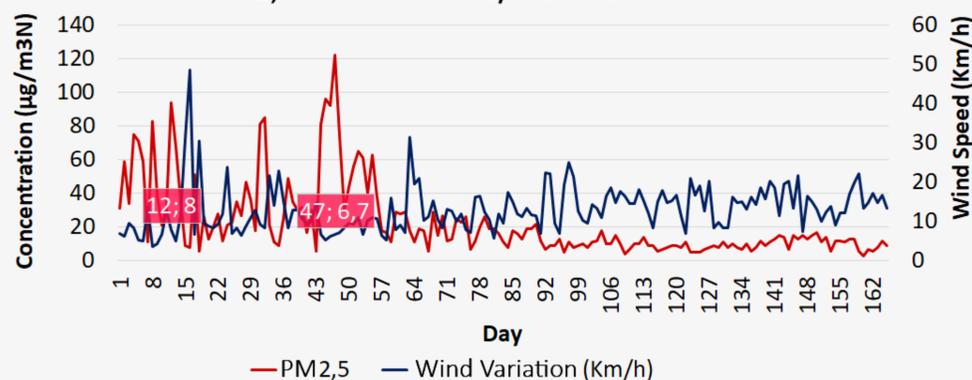


It is possible to see that there is an increase in particulate matter concentrations from 2015 to 2017. Also, in both years the most affected seasons are autumn and winter, then it could be found a relationship between particulate matter concentrations and climate changes (temperature and wind).

PM 2,5 Concentration v/s Temperature Variation



PM 2,5 Concentration v/s Wind Variation



From these graphs it can be seen that:

- At higher temperatures, lower concentration of particulate matter.
- On less windy days there was a greater concentration of particulate matter.

Given that in 2015 Talcahuano was declared a saturated zone and in 2017 it reached high concentrations.

How will concentration level be this year?

Using hypothesis testing with a 5% level of significance it was possible to estimate that this year would present a higher concentration of particulate matter 2,5.

Conclusion

To corroborate the previously seen:

- Talcahuano had 6 environmental alerts in the year 2015.
- In the year 2017 Talcahuano had 9 environmental alerts and 3 environmental pre-emergences.
- If this year's data are validated, Talcahuano would have 2 environmental alerts and 5 environmental pre-emergences.

This could mean that this year had less presence of high winds and lower temperatures.