

## THE LEVEL OF AIR POLLUTION WITH AMMONIA IN THE CITY OF SATU-MARE IN 2018-2022

KÖTELES Nandor<sup>1\*</sup>

<sup>1#</sup> University of Oradea, Faculty of Environmental Protection, Gen. Magheru st., no.26, 410048, Oradea, Romania, e-mail: kotelesnandor@yahoo.com

### Abstract

This paper studies the degree of air pollution with ammonia between 2018 and 2022 in the area of Satu-Mare. The data for this work was obtained from the Satu-Mare Environmental Protection Agency, an agency that monitors pollution levels in Satu-Mare County.

Two ammonia sampling points are installed in the area of Satu-Mare. One sampling point is located in the central area at APM Satu-Mare headquarters, and the second one is located in the industrial area Șoimoșeni Platform where there is a chicken slaughterhouse (one of the main sources of ammonia pollution).

One sampling point is located in the central area at APM Satu-Mare headquarters, and the second one is located in the industrial area Șoimoșeni Platform where there is a chicken slaughterhouse (one of the main sources of ammonia pollution).

Keywords: Ammonia, monitoring, harvesting points, maximum permissible concentration.

#Corresponding author: [kotelesnandor@yahoo.com](mailto:kotelesnandor@yahoo.com)

### INTRODUCTION

Ammonia can come from several sources, which can be natural or anthropogenic (Moza, 2009). The most widespread source of pollution is anthropogenic (80%). Livestock farming is the most important polluter through manure production, from the combustion of biomass for land recovery, from fermentation processes of organic substances, as well as from the use of nitrogen fertilizing substances.

Sources of industrial pollution are ammonium factories, urea, organic syntheses, refrigeration industry, etc.

Ammonia is a natural constituent of the atmosphere, NH<sub>3</sub> is a colorless, drowning gas with a pungent odor, soluble in water, 1.7 times lighter than air (Köteles 2011, Pereș, 2011).

The effects of ammonia exposure consist of irritation of the skin and mucous membranes of the airways, eyes, a concentration of ammonia of 0.5% in the inspired air, can produce death within 30-60 minutes.

### MATERIAL AND METHOD

For this study of the level of ammonium air pollution in Satu-Mare, between 2018 and 2022, we used data from the Satu-Mare

Environmental Protection Agency ([www.apmsm.ro](http://www.apmsm.ro)).

Two sampling points are located in Satu-Mare. One is located at APM-Satu-Mare headquarters in the central area, and the second point is located on the Șoimoșeni Platform in the north of the city in the industrial area (Köteles & Pereș, 2017).

The maximum permissible concentration for ammonia is 100 μm/mc (STAS 12574/1987, Order 592/25.06.2002).

### RESULTS AND DISCUSSIONS

#### 1. Evolution of annual average ammonium concentrations

The highest ammonium value that was determined during the period under consideration (2018 - 2022) was measured in 2018 at the sampling station on the Șoimoșeni Platform of 34.64 μm/mc. Followed by 33.93 μm/mc in 2020 and 33.72 μm/mc in 2022, also at the Platform Șoimoșeni.

The lowest values were recorded at headquarters in 2018 of 14.08 μm/mc, followed by 16.22 μm/mc (2019) and 16.82 μm/mc (2020) (Figure 1).

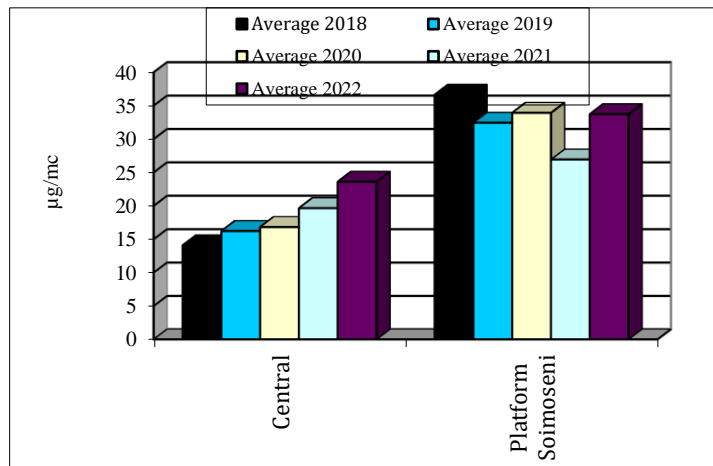


Figure 1. The evolution of the average annual ammonium concentrations in Satu-Mare county, during the period 2018-2022

From the analysis of the average of the five years, which were taken into the study (2018 - 2022), it results that the highest ammonia concentration was determined at the

Şoimoseni Platform sampling station 33.74 µm /mc, and in the sampling station at the headquarters was 17.88 µm/mc (figure 2).

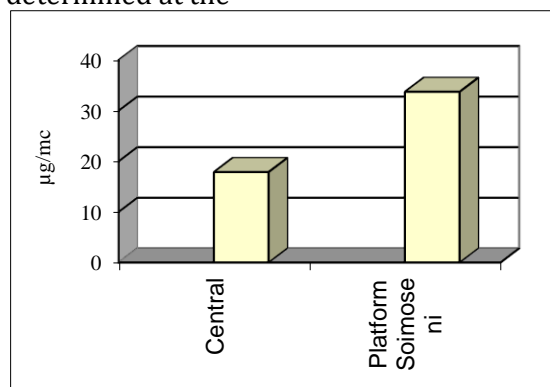


Figure 2. The evolution of multiannual average concentrations (2018 – 2022) of ammonium in the 2 monitoring points in Satu-Mare

2. Evolution of the monthly average of ammonia

Following the analysis of the points of the two sampling stations, we can find that the highest average concentrations were recorded in May, 2019 of 61.39 µm/mc. Higher values were also determined in February 2019 of

57.61 µm/mc and 56.78 µm/mc in July also in 2019.

The lowest values were determined in January of 12.82 µm/mc in 2018, 15.79 µm/mc in April 2020 and 17.09 µm/mc in June, 2020 (Figure 3).

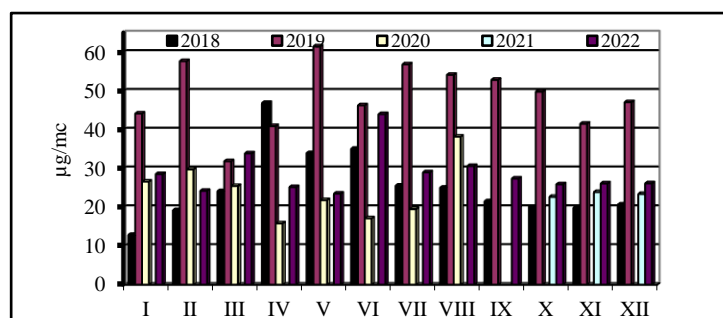


Figure 3. Monthly average values of ammonia in Satu-Mare county, during 2018-2022

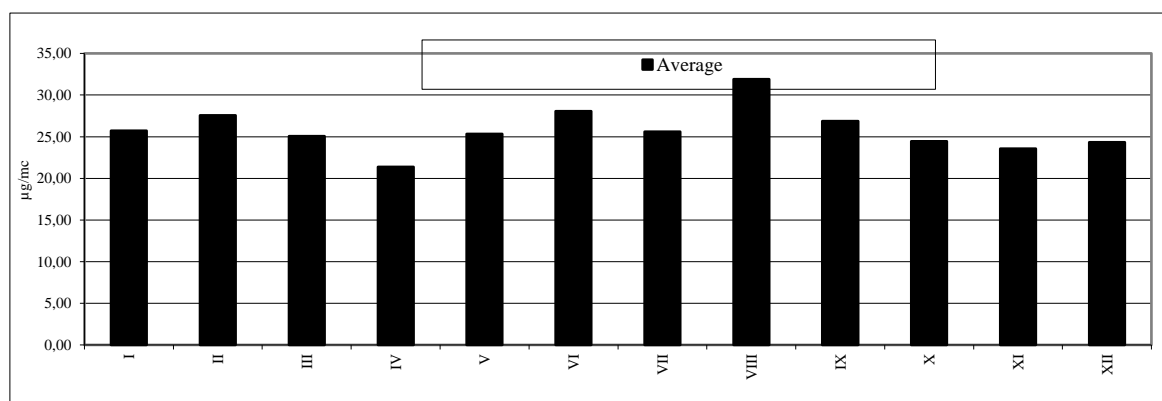


Figure 4. Evolution of multiannual monthly average ammonia concentrations in Satu-Mare (average of 2 points)

Following the analysis of the evolution of the five years studied (2018 - 2022), the highest average of the two observation points was determined in August 30.19 µg/mc, followed by June 29.79 µg/mc and April 28.66 µg/mc.

The lowest concentrations were determined in January 22.48 µg/mc, November

22.63 µg/mc and October 23.35 µg/mc (figure 4.).

### 3. Daily course of ammonia

During 2018, 673 determinations were made and 2 exceeded of the maximum permissible concentration were recorded, in May 237.87 µg/mc and in June 107.82 µg/mc (see table 1).

Table 1.

Number of determinations, exceeded and value recorded ammonia in Satu-Mare, in 2018

Sampling points/ month	Number of determinations	Platform Şoimoşeni	
		Number of exceeded	Exceeded values. µg/mc
I	46	0	0
II	76	0	0
III	82	0	0
IV	72	0	0
V	47	1	237.87
VI	46	1	107.82
VII	49	0	0
VIII	70	0	0
IX	46	0	0
X	50	0	0
XI	46	0	0
XII	43	0	0

In 2019, 538 determinations were made and two exceeded were determined in May 116.04 µg/mc and 115.60 µg/mc in June (see table 2).

For 2020, only 343 determinations were made, because in September - December for technical reasons no determinations were

made. The maximum permitted concentrations have not been exceeded.

During 2021, only 158 determinations were made, in October, November and December, no exceeded of the maximum permissible concentration were recorded.

In the last year under study, 556 determinations were performed and the maximum ammonia concentration was not exceeded.

Table 2.

**Number of determinations, exceeded  
and value recorded  
ammonia in Satu-Mare, in 2019**

Sampling points/ month	Number of determinations	Platform Șoimoșeni	
		Number of exceeded	Exceeded values. μg/mc
I	45	0	0
II	39	0	0
III	43	0	0
IV	45	0	0
V	43	2	116.04 115.60
VI	45	0	0
VII	50	0	0
VIII	42	0	0
IX	47	0	0
X	50	0	0
XI	46	0	0
XII	43	0	0

### CONCLUSIONS

From the analysis of ammonia evolution in the five years under study (2018 - 2022) in the area of Satu-Mare, it results that the maximum ammonia concentrations were exceeded four times, the highest concentration being 237.87 μm / mc.

These exceeded were recorded during the warm periods of the year, in May, June, because the slurry fermentation processes are more pronounced. The exceeded recorded were short-term

Higher concentrations were determined at the sampling point in Soimoseni Platform which is located in the industrial area of the city where the chicken slaughterhouse is located.

### REFERENCES

- Köteles, N., 2011, Practical and Theoretical Notions of Air Pollution, Editor Universității of Oradea, ISBN 978-606-10-0694-6
- Köteles, N., & Pereș, A. C., 2017, The Level of Air Pollution with Ammonia in The City of Satu Mare in 2014-2016, Natural Resources and Sustainable Development
- Moza A. C., 2009, Climate and Air Pollution in The Crișul Repede River Basin. Editor Universității of Oradea, ISBN 978-973-759-775-5
- Pereș, A. C., 2011, Pollution and Self-purification of the Atmosphere, Editor Universității of Oradea, ISBN 978-606-10-0693-9  
(STAS 12574/1987, Order 592/25.06.2002).  
[www.apmsm.ro](http://www.apmsm.ro)