Documentation of NO2 objective estimation for the measurement station AB1 (IT1678A) - year 2017

INTRODUCTION

The estimation of the annual limit value and of the number of exceedances of the hourly limit value of NO2 for the measurement station AB1 (IT1678A) for the year 2017 is necessary because of the replacement of the fixed measurements AB1 that has been shut down at the end of 2016 due to force majeure.
The most suitable available measurement values for estimation are coming from the mobile measurement station ML2, positioned in December 2016 along the A22 highway south of Bolzano as part of the Brenner-LEC project and from the new AB3 measurement station. On the 07.12.2017 it was located about 1800 m north from the former AB1. The distances from the highway and the microscale siting details of the abovementioned measurement stations AB1, AB3 and ML2 are very similar.

PROCEDURE

Assuming that the measured values of AB3 would be quite similar to those measured at the site of the former AB1 as a consequence of the reduced distance from the former site and of the similar micro-positioning, the data of AB1 for 2017 will be calculated from the data measured by ML2 in 2017 corrected by the factor K_{AB1}.
The factor K_{AB1} is calculated by dividing the mean of the available data of AB3 by the mean of the available data of the ML2 over the same measurement period from 7.12.2017 to 03.07.2018.
The period 7.12.2017 - 03.07.2018 is considered to be sufficiently representative for the whole year, while containing in a balanced manner winter, summer and intermediate data.
The factor obtained from the data of about 6 months in 2017-18 is applied to all data of NO2 of ML2 in 2017.

CALCULATION OF THE FACTOR K_{AB1} between AB3 (for AB1) and the ML2 comparison station in 2017-18

Available database: hourly averages of NO2 in the period 07.12.2017 - 03.07.2018 for ML2 and of the fixed measurement station AB3 (replacing the AB1).
The database for the calculation consists of the hourly averages of the valid measurement values only if present in both measuring stations.

Calculation of the factor of NO2 between AB3 and ML2:
$\mathbf{K_{AB1} = AVG\_NO2_{AB3} / AVG\_NO2_{ML2} = 1{,}058}$

ESTIMATE of the annual average of NO2 for AB1 in 2017

The hourly averages of NO2 estimated for AB1 are calculated by multiplying the hourly values of ML2 with the factor K_{AB1} = 1.058.
The resulting annual NO2 average estimated for AB3 is 62.9 µg/m³.

ESTIMATE of exceedance of the NO2 hourly limit value for AB1 in 2017

The hourly averages of NO2 of ML2 and AB3 has been analyzed in order to estimate the exceedance of the limit value of 200 µg/m³ in AB1 in 2017.
There are two periods in which the behavior of the NO2 concentration values is different.

- Analysis of the first period:

In the first period, from 7.12.2017 to the end of February 2018, the NO2 trends of ML2 and AB3 are similar, but in most cases the highest NO2 concentration peaks of ML2 exceed those of AB3.

The NO2 values of the ML2 corrected with the factor K_{AB1} (= AB1) would still increase the divergence with the peak values of AB3 and near the limit value would introduce fake exceedances at the AB1 that don't exist either at the AB3.

- Analysis of the second period:

From the end of February 2018 to 3.7.2018, the NO2 concentration fall to lower values, and the exceedance of the limit value is really unlikely.

CONCLUSION

For these reasons we estimate that for the year 2017 in station AB1 there has been no exceedance. Furthermore, we observe that even in the past years the exceedances of the NO2 hourly limit value at AB1 were very rare (only on 4 days over 14 years).
Basing on historical data and on the rather constant general trend of NO2 concentration in Alto Adige in recent years, it can be stated that the number of exceedances of the NO2 hourly limit for the year 2017 is zero or very next to zero.