REPUBLIC OF SLOVENIA
MINISTRY OF THE ENVIRONMENT AND SPATIAL PLANNING
SLOVENIAN ENVIRONMENT AGENCY

Vojkova 1B, 1000 Ljubljana

LIFE 15 IPE IT 013

prepAIR Po Regions Engaged to Policies of Air

Impact of COVID-19 epidemic measures on air quality in Slovenia

Project LIFE15 IPE IT 013 - PREPAIR

Date: July 8, 2020

Project manager: dr. Janja Turšič

Author: dr. Rahela Žabkar, deputy of the project manager

Rahela Žabkar Digitalno podpisal Rahela Žabkar Datum: 2020.07.13 11:00:40 +02'00'

Introduction

The stay-at-home and other related measures, implemented by The Government of the Republic of Slovenia to reduce the spread of COVID-19, have led to a sudden decrease in road transport, social and economic activities. Epidemic in Slovenia was declared by the Government between March 12 and May 15, 2020. This report assesses how the measures, implemented during weeks with the strictest restrictions (when particularly traffic emissions were significantly reduced) affected concentrations of nitrogen dioxide (NO_2), nitrogen oxides (NO_x) and particulate matter (PM_{10}) measured at Slovenian monitoring stations.

Measured concentrations of pollutants NO_2, NO_x and PM_{10} during time period from March 15 to May 15 2020 were compared with the same time period during the previous years. Exception was desert dust episode from March 27 to March 29, 2020. These three days were, for year 2020, excluded in comparisons of PM_{10}, due to extremely high measured levels of particulate matter at Slovenian stations from natural sources.

Not only emissions but also meteorological conditions with certain inter-annual variability play a significant role in air quality. The analyzed days in year 2020 were in average significantly drier with 50% less precipitation measured at Slovenian meteorological stations than the mean of 2016-2019 and even 30% of precipitation of the previous year. Measured temperatures were close to the previous year's average and at the most monitoring sites it was slightly more windy than usual.

Results

The average measured levels of pollutants NO_2, NO_x and PM_{10} and the mean diurnal and mean weekly courses in the time period of COVID-19 epidemic in Slovenia at the measuring sites Ljubljana, Celje, Zagorje, Maribor and Nova Gorica for years from 2012 onwards are shown in Figures 1 – 3.

The greatest impact of the epidemic measures was observed in the case of NO_x, where on average the measured concentrations at analyzed monitoring sites were as much as 47% lower than during the same period in 2019 or 48% lower than was the average of years 2016 to 2019.

A slightly smaller impact was observed for NO_2 with 40% reduction in 2020 in comparison to 2019. Reduction is the same, when year 2020 is compared to the average of years 2016 to 2019.

The impact of COVID measures was the lowest for PM_{10} levels. In 2020 the measured levels were 13% lower than previous year and 14% lower compared to the mean of 2016 to 2019 during the same time period.

Conclusion

Results of analyses are representative for the impact of COVID measures during the springtime conditions. During the wintertime or any other part of the year, the conclusions about the impact of the same measures on air quality, might be different. Besides, it is necessary to take into account not only variability of meteorological conditions, but also the annual variability of emissions. In winter, the most problematic source of PM_{10} air pollution is domestic heating due to residential wood burning in inefficient old small fireplaces. These emissions would presumably not decrease, but might even increase, if epidemic COVID-19 measures would have been realized during the wintertime, as residents would spend more time at home due to lock-down and movement restrictions.

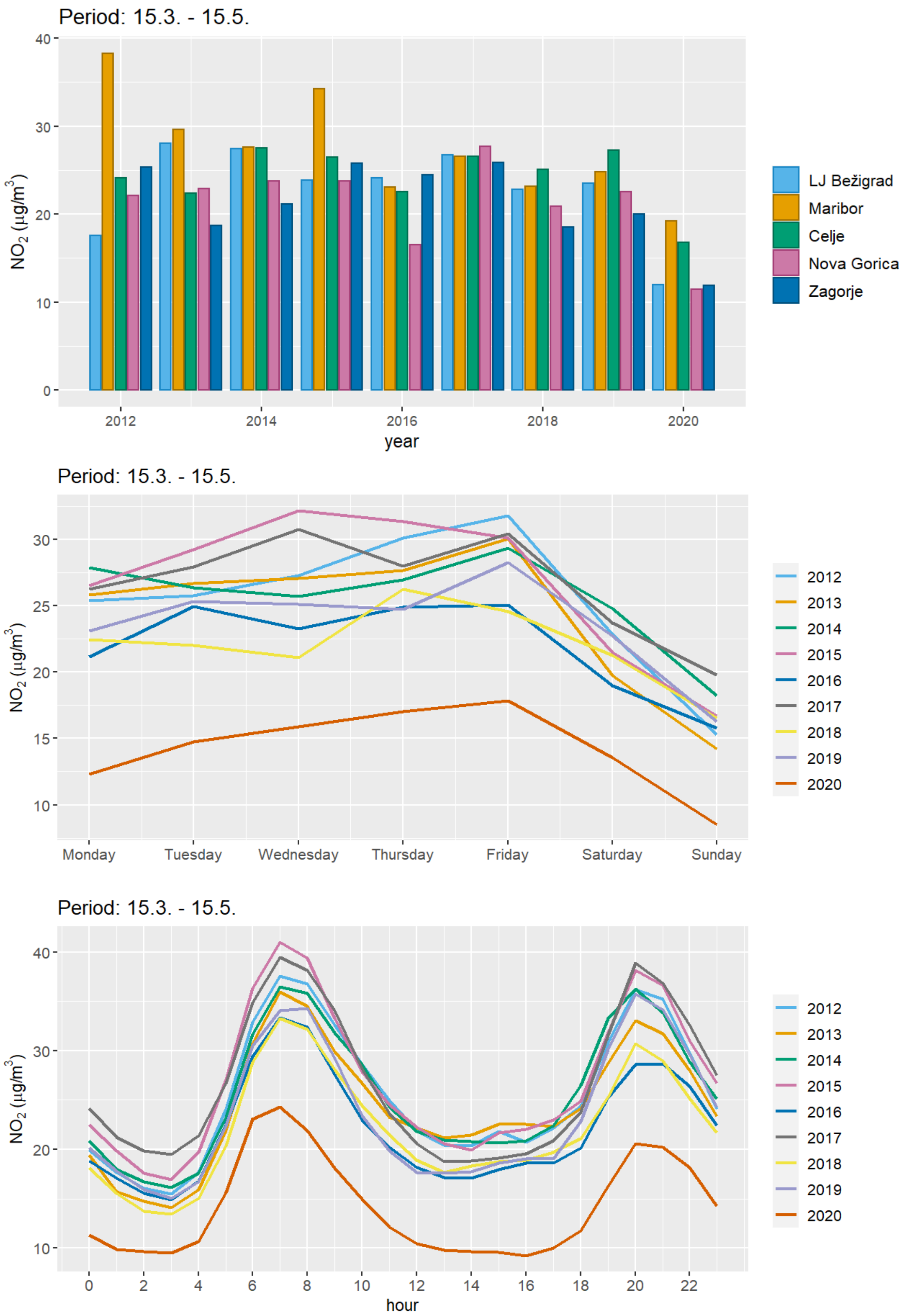

Figure 1: Comparison of total means, mean diurnal and mean weekly courses for NO_2 in different years for stations Ljubljana Bežigrad, Maribor, Celje, Nova Gorica and Zagorje.

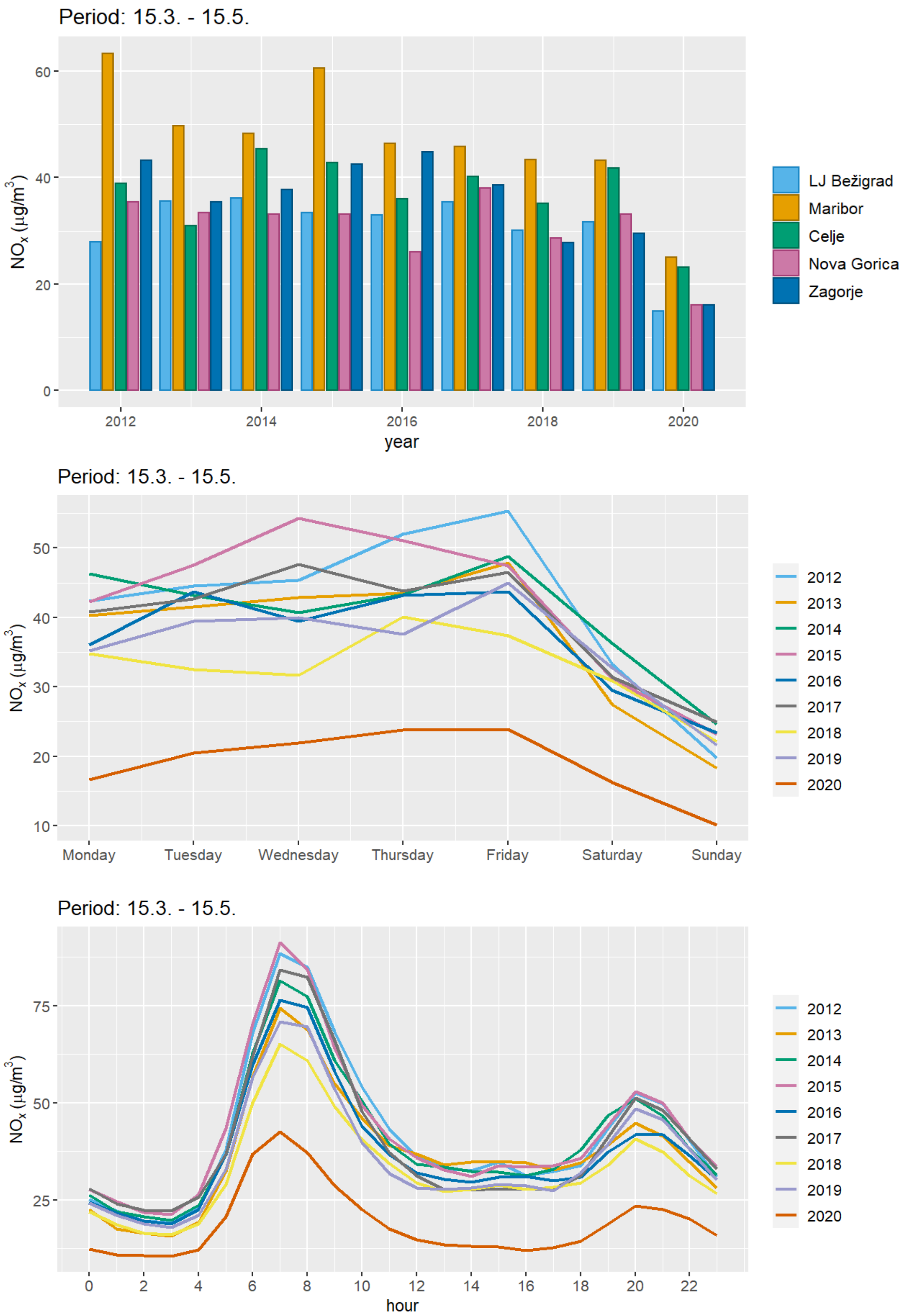

Figure 2: Comparison of total means, mean diurnal and mean weekly courses for NO_x in different years for stations Ljubljana Bežigrad, Maribor, Celje, Nova Gorica and Zagorje.

Figure 3: Comparison of total means, mean diurnal and mean weekly courses for PM_{10} in different years for stations Ljubljana Bežigrad, Maribor, Celje, Nova Gorica and Zagorje.