

# IMPACTS OF COVID-19 ON AIR QUALITY IN ABBOTSFORD AND BURNABY SOUTH

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## Introduction

**COVID-19** has had a profound impact on our way of life. Highways, roads, airports, and many other transportation-related infrastructures fell eerily silent when the first wave hit BC. However, despite the lockdown and other restrictions, certain industries were not greatly affected. Essential jobs in farming and agriculture had to continue. Since pollutants can be sourced from agricultural activities, the research will focus on COVID-19 impacts on agriculture-based cities, i.e. Abbotsford, in the Lower Mainland. We hypothesize that air quality will be reduced more in suburban areas (Burnaby South) than agricultural areas (Abbotsford) under COVID-19 lockdown.

## Methods

The data was taken from the station at Abbotsford Central (as the agriculture-based city) and at Burnaby South (as the control) through Envista BC Air Data Archive<sup>1</sup>. Data on pollutant concentrations were taken from months in 2019 to 2020 to account for seasonal variations. Note that only January to November months were compared since 2020 has not ended yet.

This year, in the summer, there have been episodes of wildfires and smoke being spread throughout the Lower Mainland. This event significantly increased the PM<sub>2.5</sub> and PM<sub>10</sub> concentrations. Since the focus is on emissions from Abbotsford and Burnaby, it was deemed necessary to remove outliers from 24 June to 7 November period.

In finding the variation in meteorological pollutant concentrations, we calculated the difference between the average daily concentrations in 2019 – 2020 and plotted the results in bar graphs (see Figures).

## Discussion

In the context of the difference between pollution levels in cities with different economies, we observe differences in the annual patterns of pollutants, specifically ozone, PM<sub>2.5</sub> and PM<sub>10</sub>.

Ozone is a pollutant that is often associated with traffic, and spring brings ozone from Asia through an accelerated jet stream, influencing background ozone levels<sup>2</sup>. Based on our findings, ozone levels in Abbotsford decreased during the lockdown. We expected that ozone concentrations would decline only slightly but not more than Burnaby's concentrations due to the assumption that transport and traffic would stay constant during the lockdown period in Abbotsford. Thus, the large increase contradicts our hypothesis. Meanwhile, ozone concentrations in Burnaby remained on par with 2019 levels. This does not concur with our hypothesis as lower traffic should lower ozone concentrations.

PM<sub>2.5</sub> and PM<sub>10</sub> are important pollutants as, in the Lower Fraser Valley, agriculture contributes to 42% of PM<sub>10</sub> emissions and 25% of PM<sub>2.5</sub> emissions<sup>2</sup>. PM<sub>10</sub> levels increased during lockdown in Abbotsford and remained constant in Burnaby. Again, this observation does not align with our hypothesis that COVID-19 would cause a reduction in emissions. However, perhaps COVID-related factors caused increased emissions in Abbotsford due to an increased demand for food from panic buying. In contrast, PM<sub>2.5</sub> levels decreased in Abbotsford and increased in Burnaby during the lockdown period. Yet again, this does not match with the hypothesis and prediction that the restrictions would decrease more emissions in Burnaby than in Abbotsford. Therefore, our findings do not suggest that pollution levels during COVID-19 lockdowns in agriculture-based cities like Abbotsford are higher than in suburban cities like Burnaby South.



## Limitations and Conclusion

A few limitations identified include gaps in datasets, the scale and number of locations studied (only two), the period for comparison (only two years; looking at a long-term average might suggest other findings), and other factors changed between months and years besides from COVID-19. Also, Abbotsford is a suburban area and, thus, may not be fully representative of agricultural emissions.

We predicted that concentrations would decrease in both Abbotsford and Burnaby because of the COVID-19 lockdown. However, we observed no indication that levels of PM<sub>10</sub>, PM<sub>2.5</sub> or O<sub>3</sub> decreased as a result of the lockdown. Additionally, Burnaby did not decrease more than Abbotsford as predicted because of its more urban demographic.

Changes in O<sub>3</sub> from 2019 to 2020

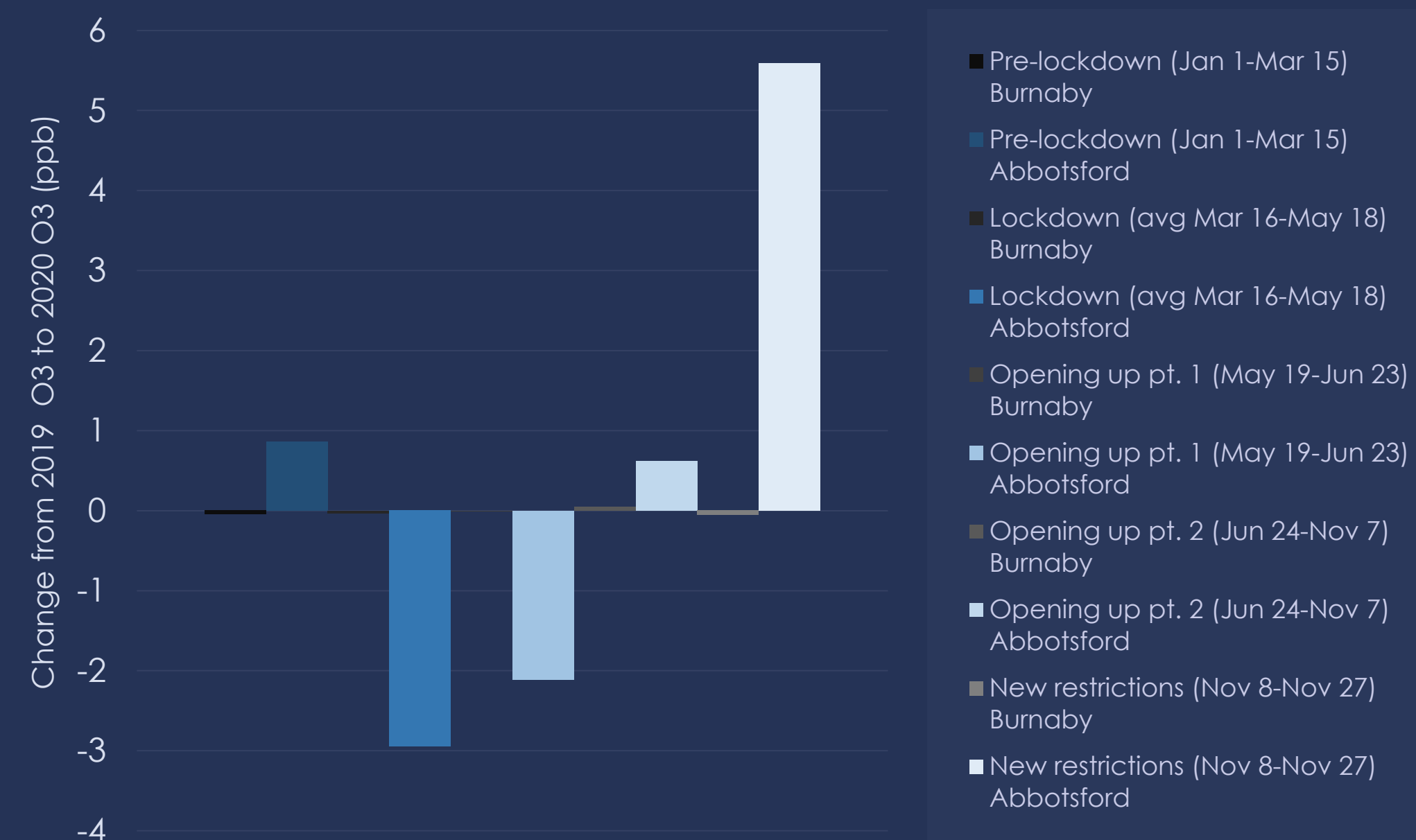


Figure 1. 2019-2020 change in ozone, from January to November.

Changes in PM<sub>2.5</sub> from 2019 to 2020

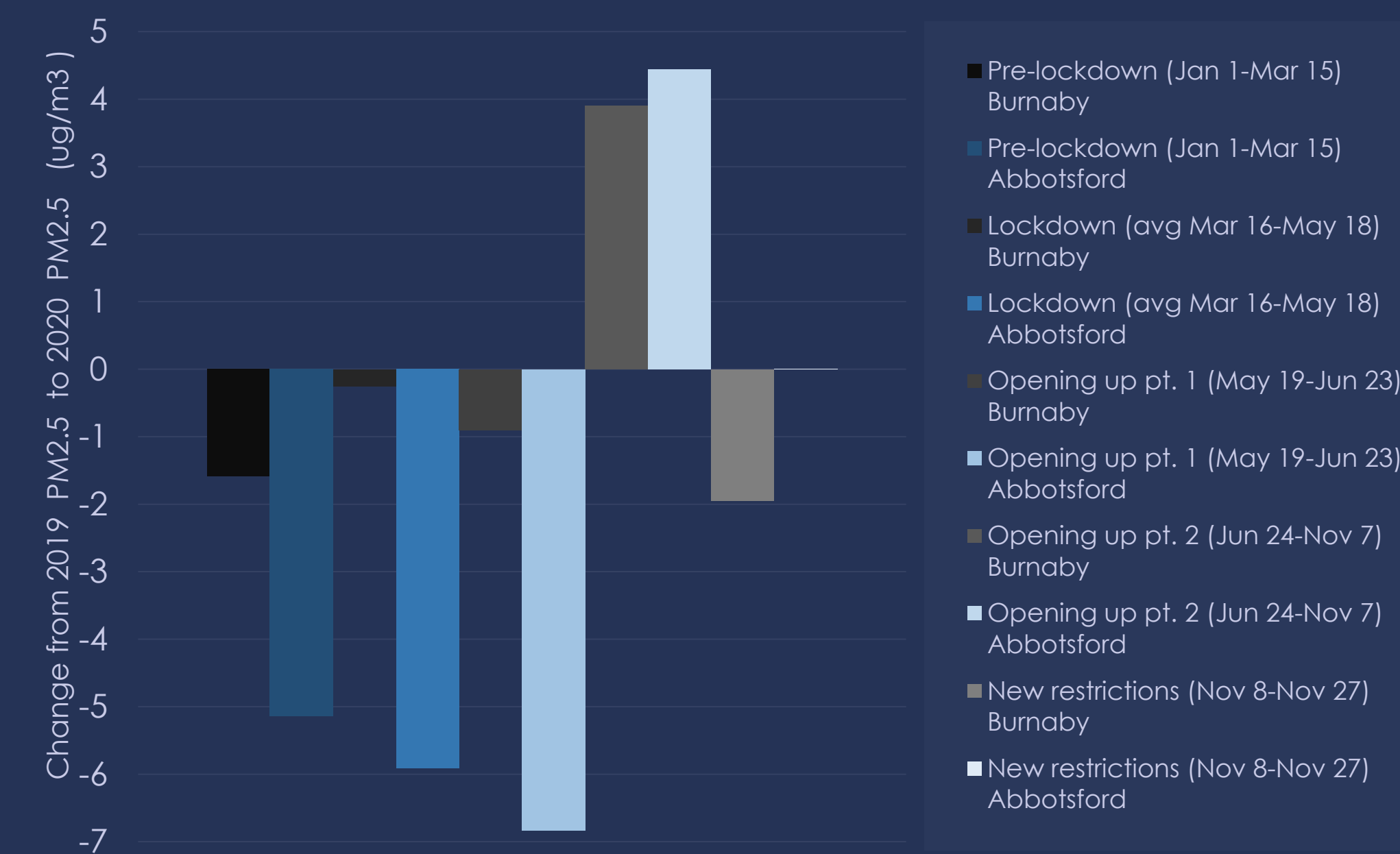


Figure 2. 2019-2020 change in PM<sub>2.5</sub>, from January to November.

Changes in PM<sub>10</sub> from 2019 to 2020

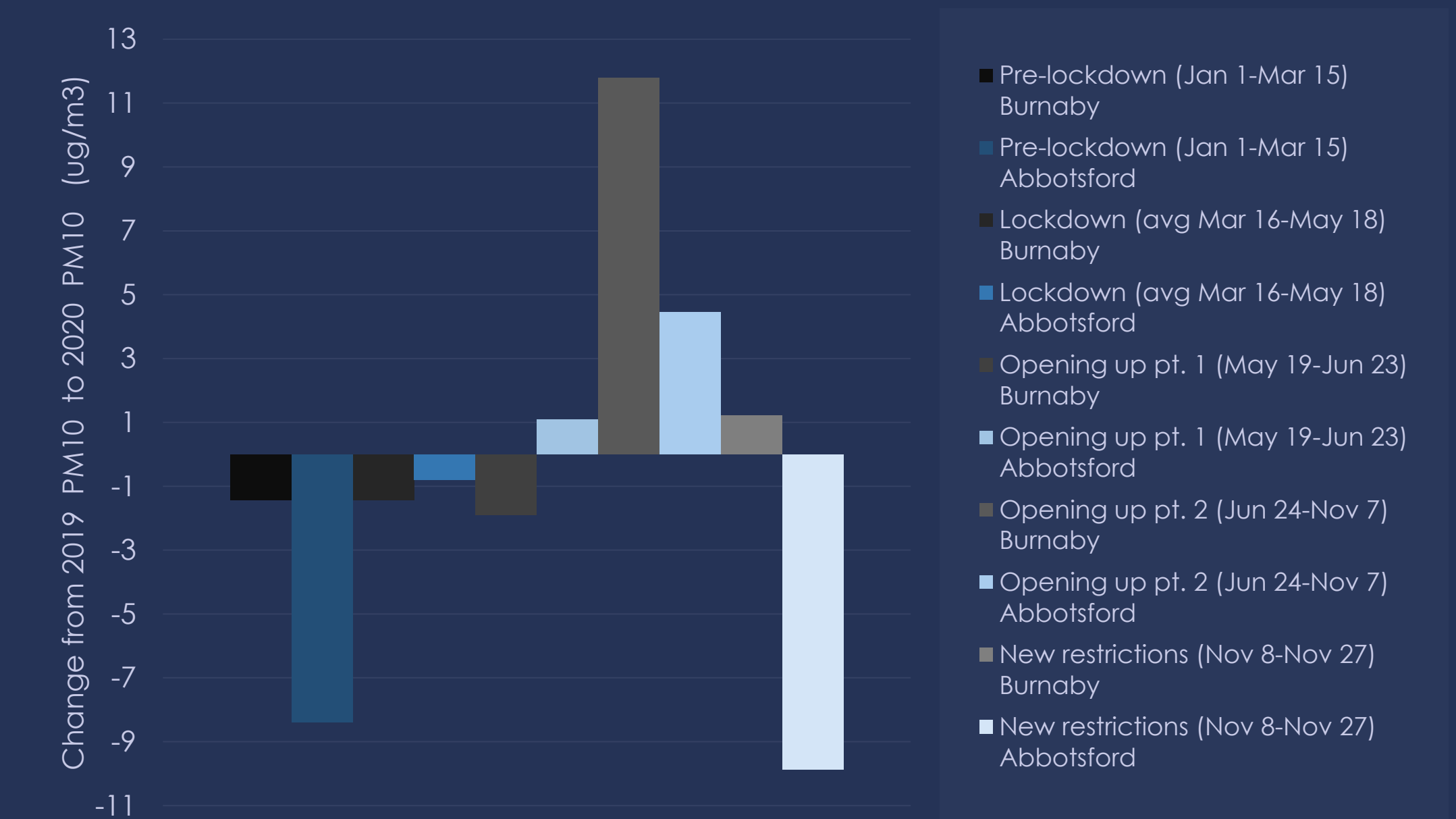


Figure 3. 2019-2020 change in PM<sub>10</sub>, from January to November.

## References

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