



Supplement of

Machine-learning models to replicate large-eddy simulations of air pollutant concentrations along boulevard-type streets

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Machine learning models to replicate large-eddy simulations of air pollutant concentrations along boulevard-type streets - Supplementary material

This supplementary material contains visualisations for the features used for training the regression models on KU18. Table 1 presents the features. Notice that most features are undefined on points that contain buildings. Note also that these features were computed with the help of auxiliary features that are not listed here, such as `is_building`, `is_inhabited`, and `is_intersection`, which are available in the supplied code. The figure titles correspond to the variable names used in the code.

Table 1: List of features used in the regression models.

| Feature name | Description |
|--|--|
| Building height | Height of the closest building |
| Canopy height | Height of the vegetation canopy |
| Courtyard | Binary variable indicating presence of a courtyard |
| Direction of closest building | Direction to the closest building relative to the wind direction |
| Distance to building downwind | Distance to closest building in the same direction as the wind |
| Distance to building upwind | Distance to closest building in the direction against the wind |
| Height to width ratio | Height of the closest building relative to the width of the street |
| Pollutant emissions | Emission level |
| Pollutant emissions convolution, $\sigma = \{1, 2, 4, 8, 16\}$ | Gaussian convolution of the emissions with standard deviation σ |
| Pollutant emissions convolution upwind, $\sigma = \{8, 16, 32\}$ | Convolution of the emissions upwind with standard deviation σ |
| Street | Binary variable indicating presence of a street |
| Street width | Width of the street |

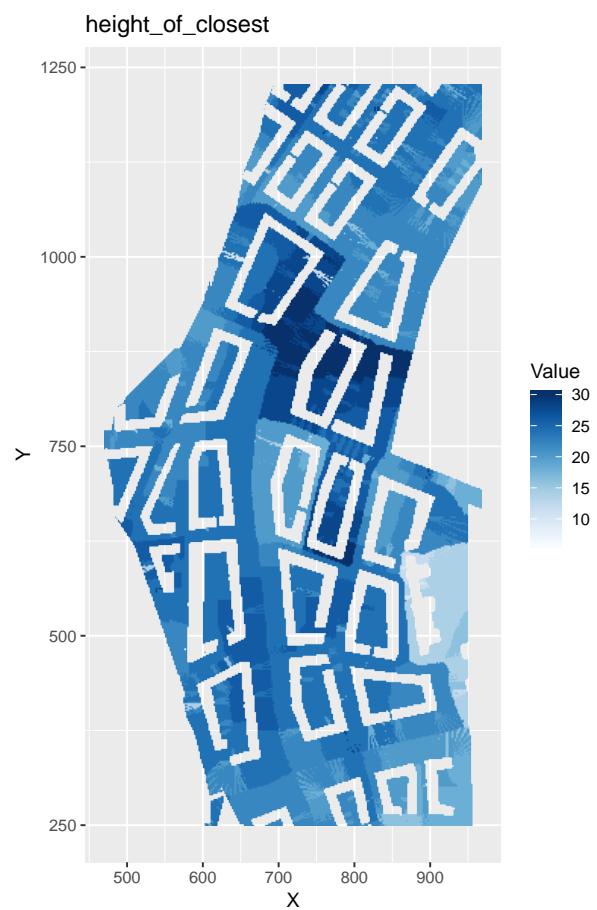


Figure 1: Building height



Figure 2: Canopy height

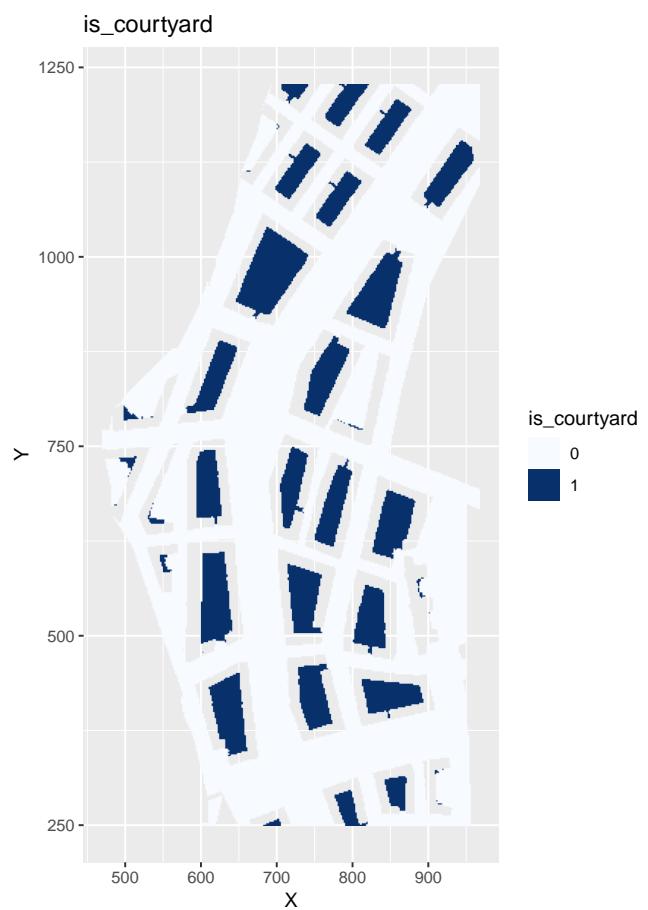


Figure 3: Courtyard

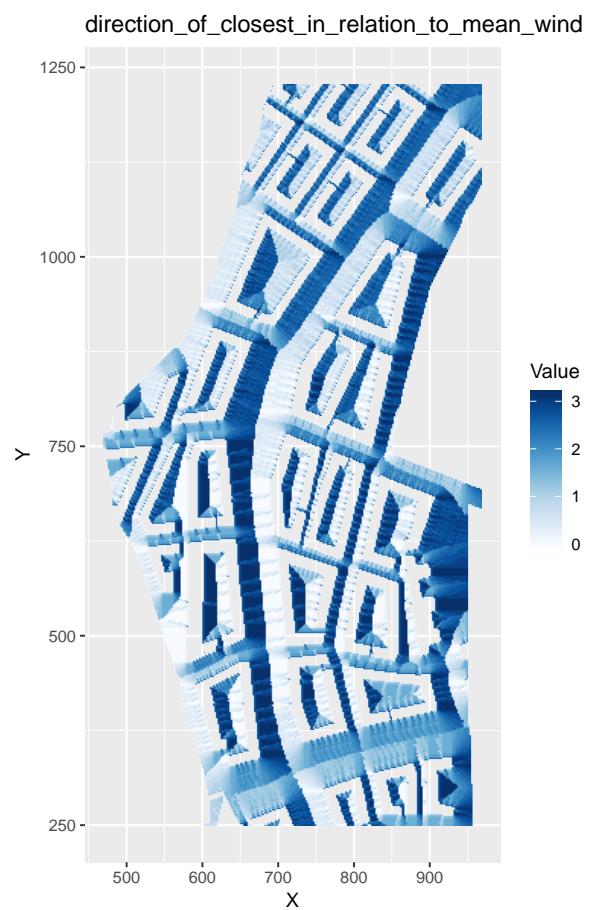


Figure 4: Direction of closest building

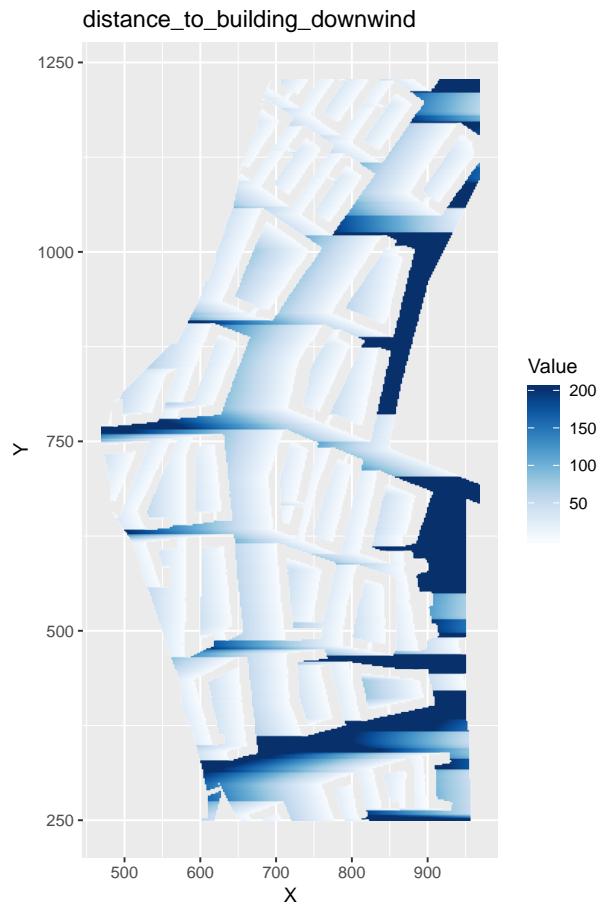


Figure 5: Distance to building downwind. Due to the particulars of the feature generating algorithm, the feature is undefined if the next building is 300m away.

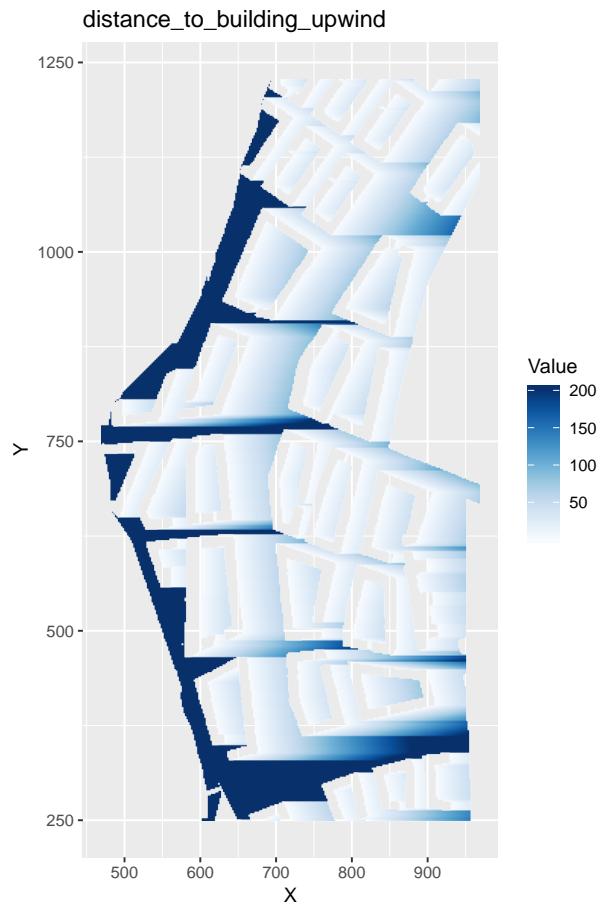


Figure 6: Distance to building upwind. Due to the particulars of the feature generating algorithm, the feature is undefined if the next building is 300m away.

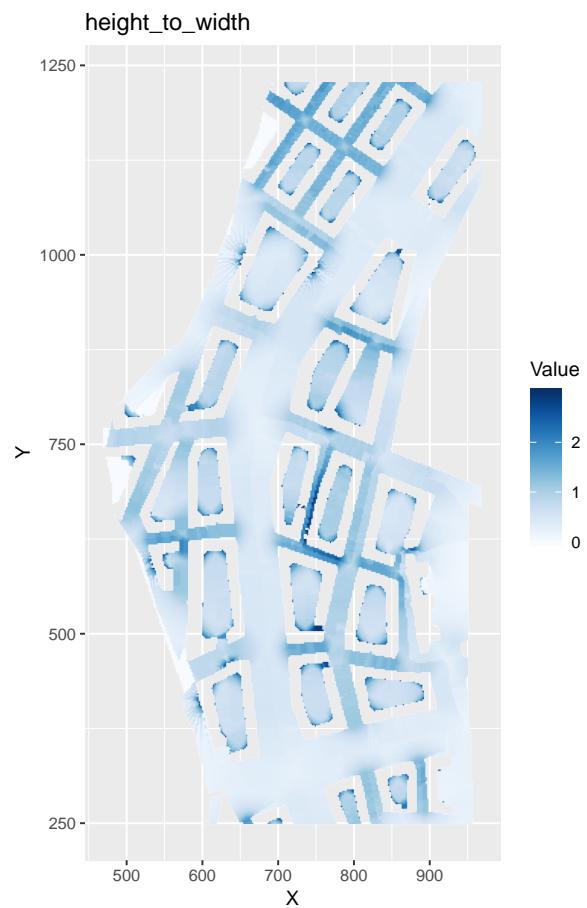


Figure 7: Height to width ratio

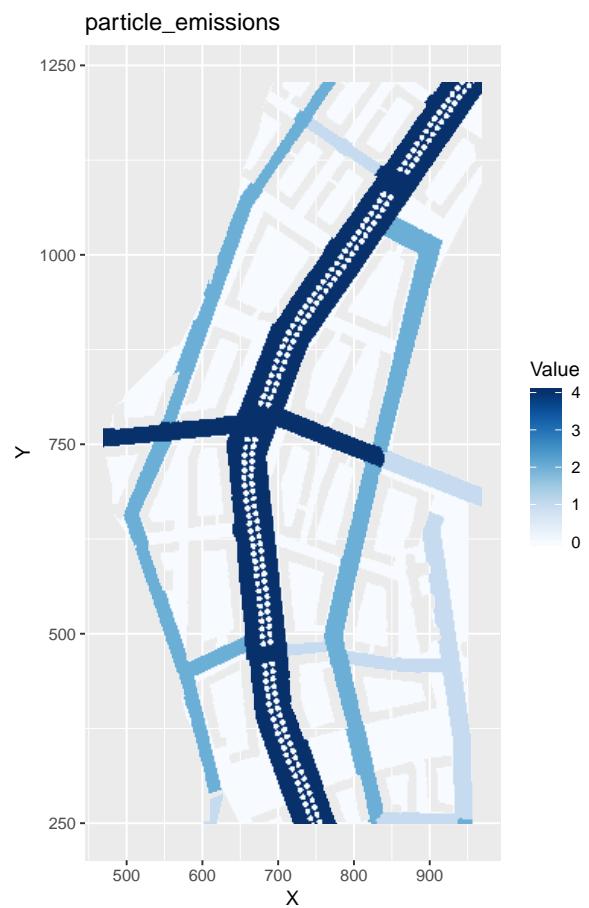


Figure 8: Pollutant emissions

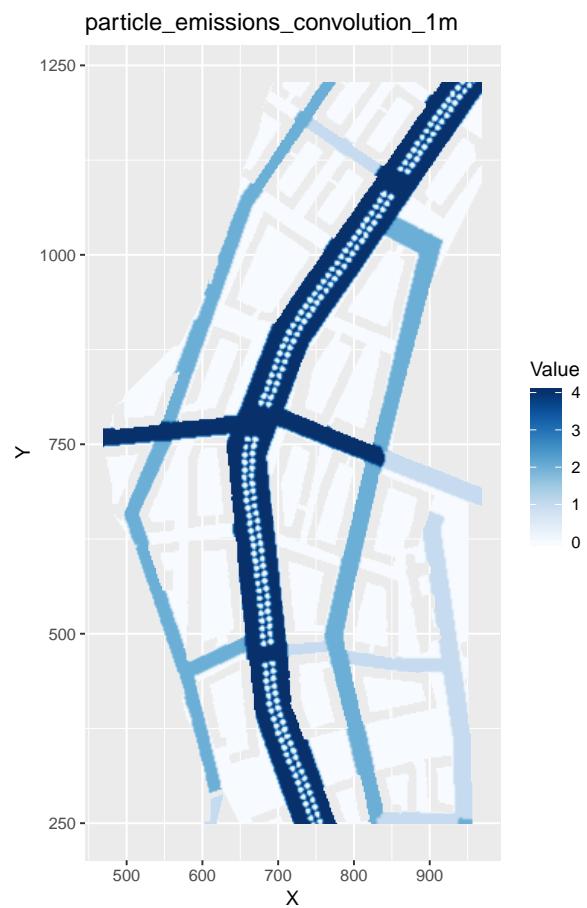


Figure 9: Pollutant emissions convolution, $\sigma = 1$

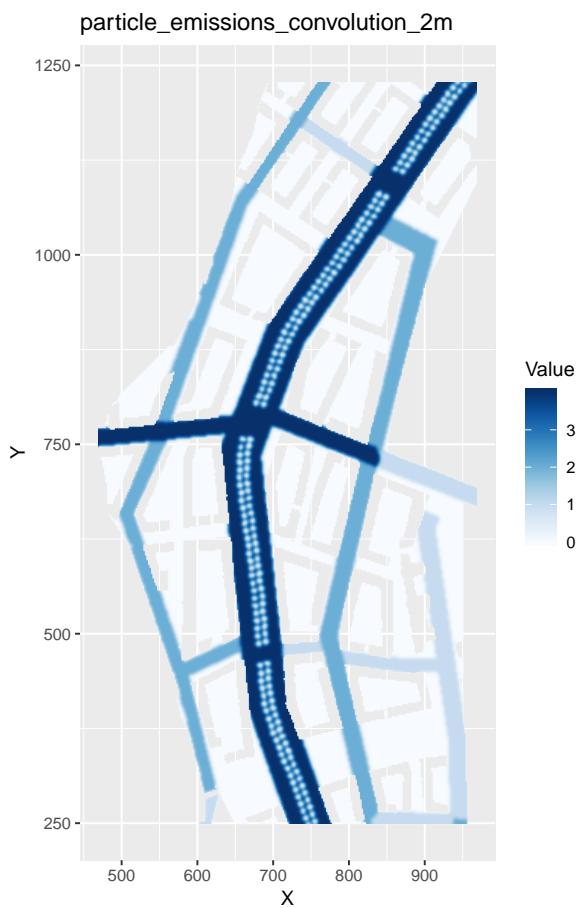


Figure 10: Pollutant emissions convolution, $\sigma = 2$

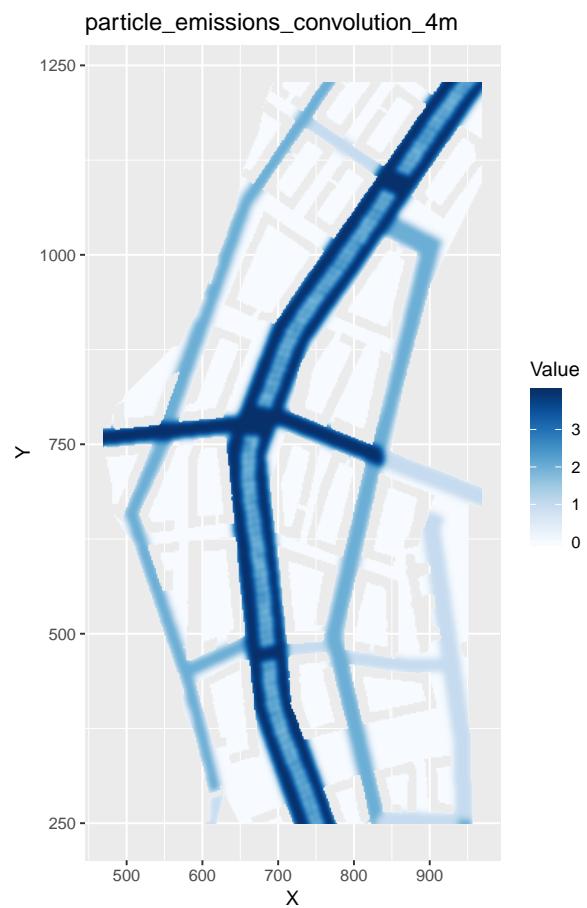


Figure 11: Pollutant emissions convolution, $\sigma = 4$

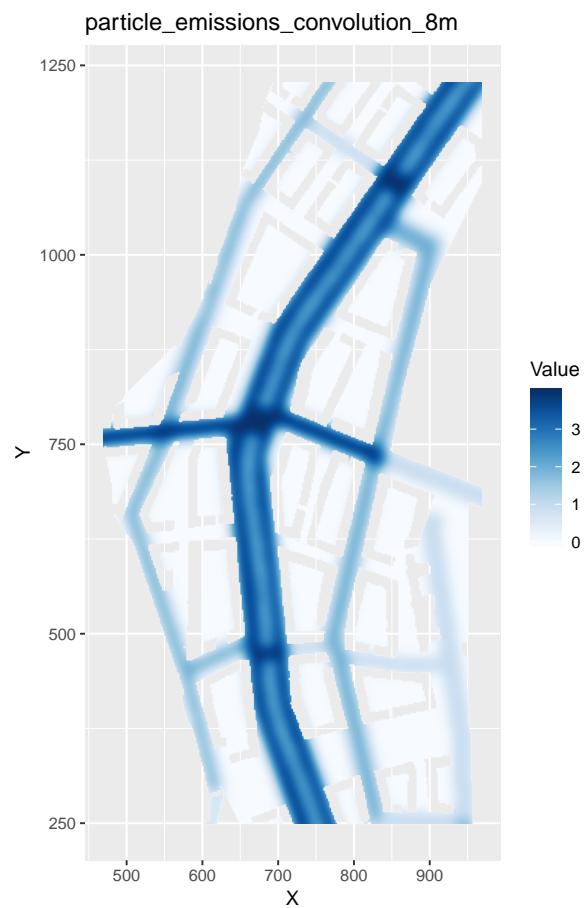


Figure 12: Pollutant emissions convolution, $\sigma = 8$

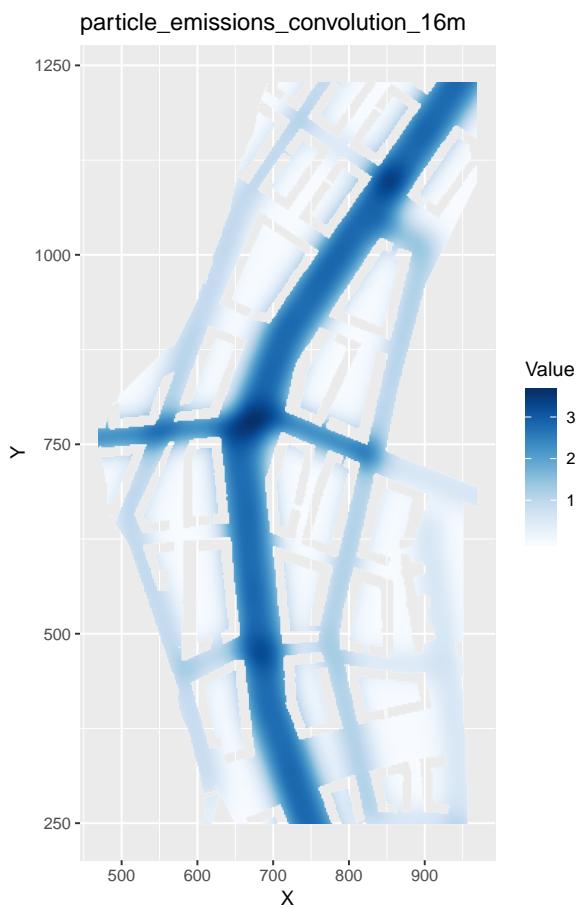


Figure 13: Pollutant emissions convolution, $\sigma = 16$

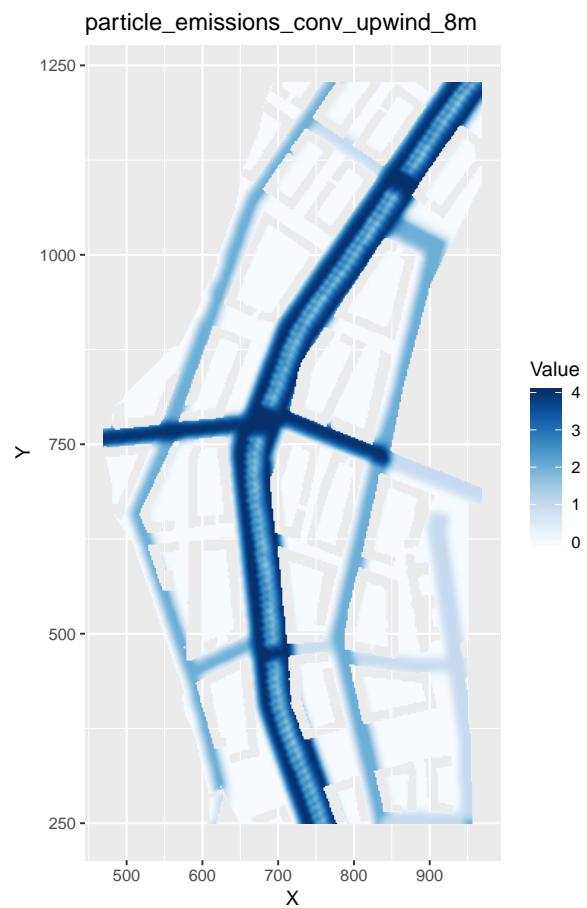


Figure 14: Pollutant emissions convolution upwind, $\sigma = 8$

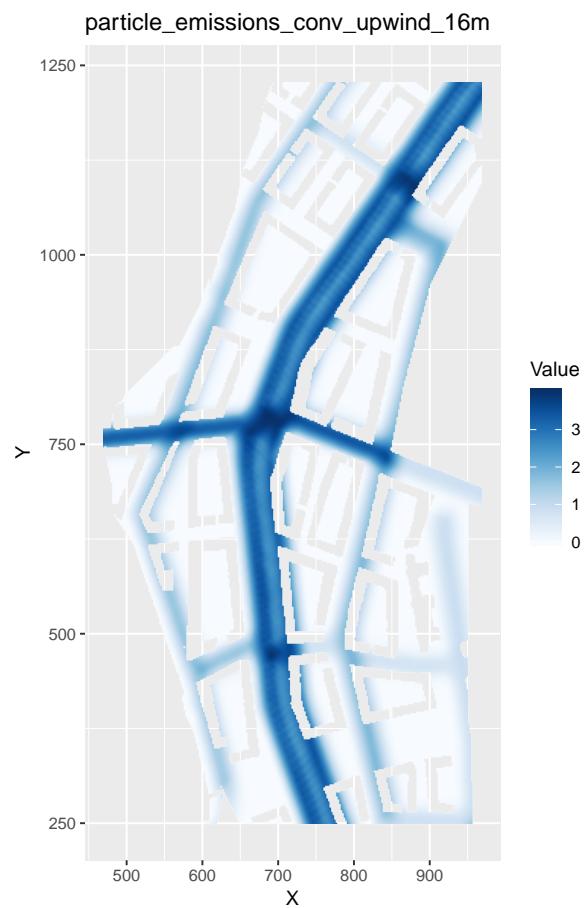


Figure 15: Pollutant emissions convolution upwind, $\sigma = 16$

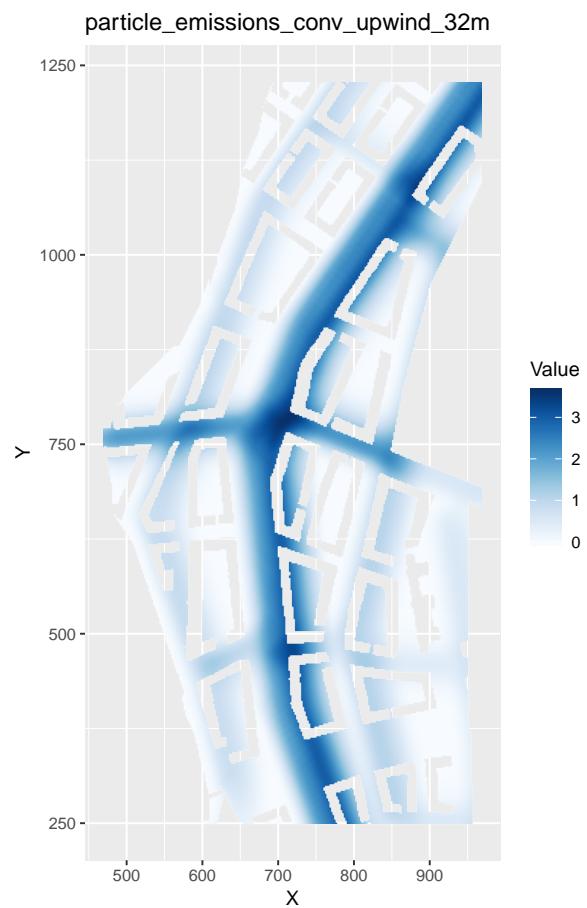


Figure 16: Pollutant emissions convolution upwind, $\sigma = 32$

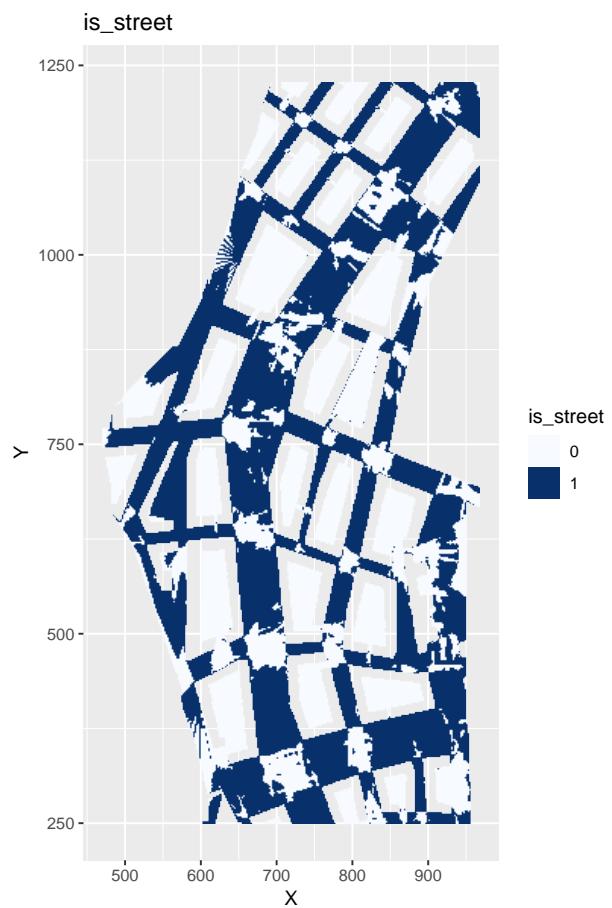


Figure 17: Street

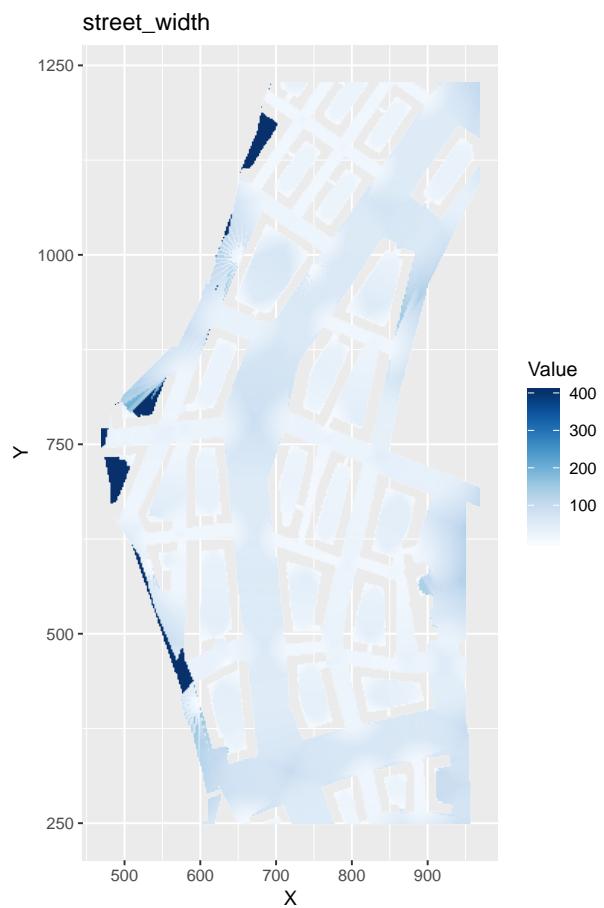


Figure 18: Street width

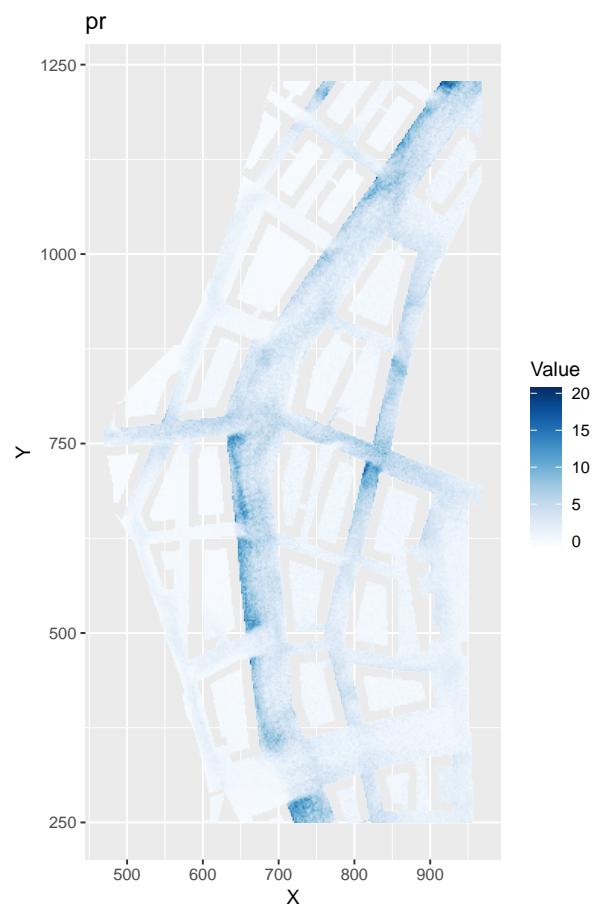


Figure 19: Pollutant concentrations (target variable)