

Additionally, we defined the open space ratio r_{os} as,

$$r_{os} = \frac{A_{os}}{A_{aa}} \quad (7)$$

where, A_{os} is the free area that is not occupied by any building and the A_{aa} is analysis area (177 m x 183 m). We found that open space ratio has a relationship with the local age of air. Actually, Figure 8 shows that those cases where open space ratio was bigger the local age of air was lower. For the study of the real city configuration, we can confirm that the open space ratio is directly related with the local age of air.

However, more consideration is required because the both of sixteen and nine buildings cases, which have almost same open space ratio, show different values of the local age of air.

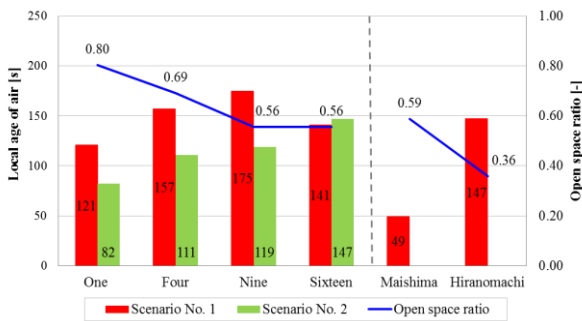


Fig. 8 Local age of air and open space ratio for scenario No. 1, scenario No. 2, Hiranomachi and Maishima.

For future work, other simulations should be conducted in order to clarify, at least in this context, the influence of the geometry, as well as the importance of the turbulent eddies in the removal of pollutants. In general, simulation results show to be in agreement with the fact that urban areas with a large amount of building and irregular configurations have as result poor ventilation.

4. Conclusions

In this contribution, we have demonstrated that the local age of air can be used as index of the ventilation efficiency in urban environments. With all the steps applied in this work, we indicated how the local age of air is used as a tool to analyze the influence of urban morphology on the city ventilation.

In addition, it was found that irregular configurations, buildings height, surroundings, street width and open space ratio have a relationship with the ventilation efficiency. Through the identification of these parameters and the study of their influence, possible modifications or suitable designs of the city spaces can be taken into consideration to help in the urban planning process to reduce the heat island effect.

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