

## **Passive urban design as a form of countermeasures against urban heat island**

***Yukihiro Masuda\*, Nobuyuki Takahashi and Toshio Ojima***

***\*Lecturer, Advanced Research Institute for Sci. & Eng, Waseda University, Tokyo, JAPAN***

The heat island phenomenon has become a serious problem in large cities in Japan due to changes in the urban environment. Especially, increases in the number of Manatsubi (days in which the highest temperature is not less than 30°C) and Nettareya (nights in which the lowest temperature is not less than 25°C) have caused serious damage to human health. Measures are therefore required to combat these effects on human health.

An effective means of combating the heat island phenomenon is channeling the sea breeze into urban areas. The importance of Kaze-no-Michi—wind paths consisting of green spaces, rivers, and open spaces—in combating this phenomenon has been examined. However, the increasing numbers of skyscrapers constructed in waterfront areas may affect the sea breeze flowing into urban areas.

This study presents data that can help make decisions for protecting and constructing spaces for Kaze-no-Michi. We performed a survey of wind conditions and temperature in the street and at three different heights in the Tokyo station area. An analysis of the data revealed that the sea breeze blows at street level nearly all day in the east of the JR line, even when no sea breeze was detected at the higher observation points. In addition, increases in temperature are related to wind velocity and differences in street topography. These observations suggest that street topography should be considered when maintaining spaces for Kaze-no-Michi.

This report presents a discussion and analysis of the urban climate. Firstly, we analyzed long-term measurements of urban climate data obtained from the public sector to determine the wind directions in waterfront areas of Tokyo. Secondly, we measured temperature and wind conditions in waterfront areas of Tokyo to confirm the existence of sea breezes. Our findings indicate that it is possible to create Kaze-no-Michi to make best use of the cooling effect of the sea breeze in waterfront areas.

Previous studies also indicate that rivers are able to carry cool and fresh air into inner-city areas; however, elevated roadways are on small-and-medium-sized rivers in Tokyo. And it may affect the flow of sea breezes along the rivers.

To investigate the extent of this problem, we conducted a measurement study along Nihonbashi River, which has an elevated roadway running over it, and determined the nature of sea-breeze flow along the river. The results reveal the effects of elevated roadways on sea breeze flowing up rivers.