Development of technologies for city planning to take effective urban heat island countermeasures

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1. Introduction

The NILIM has been, through cooperative research with the Building Research Institute, conducting a research project jointly with the concerned bureaus of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) to provide simulation tools and urban planning guidelines to local governments in order to enable them to systematically implement effective urban heat island (UHI) countermeasures.

2. Ventilation path as a heat island countermeasure

In order to clarify the actual state and effectiveness of ventilation paths, which have attracted attention as a UHI countermeasure, we are performing large-scale meteorological observations at 190 locations on streets and rooftops of buildings in central and bay area in Tokyo and carrying out numerical simulations using super computer.

It has, for example, been predicted that as the result of creation of a ventilation path accompanying large-scale redevelopment around Tokyo Station, airflow will improve, lowering the air temperature by up to 2°C (Fig. 1) over a wide area.

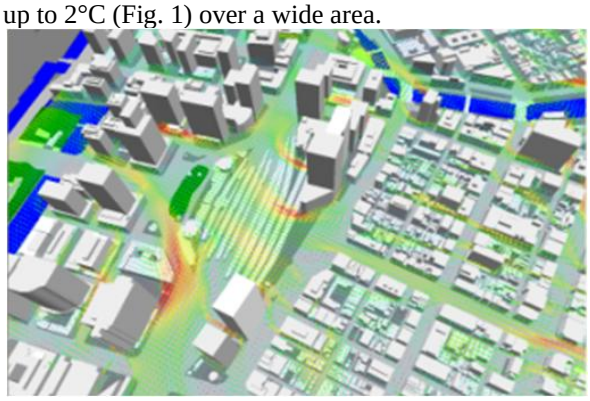

Figure 1. Example of a Simulation of the Effectiveness of a Ventilation Path

3. Development of technologies for urban planning

To enable regional governments to predict various countermeasure effects of greening, water retentive paving, ventilation path and so on in city planning, super computer calculation programs have been combined with personal computer software to be used as practical simulation tools capable of predicting the effects of district scale countermeasures. This software has been used by local governments such as Chiyoda Ward in Tokyo, Osaka City, and Kita-kyushu City.

And an environmental atlas called Climatic Atlas of Urban Environments was trial prepared with numerical simulations visualizing the thermal environment including air temperature distribution and airflow etc. as reference information for city planning. Figure 2 is an example of a prototype based on the countermeasure effects of ventilation path etc.

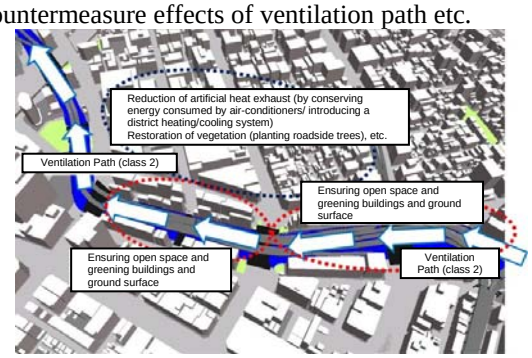

Figure 2. Example of a Prototype of Climatic Atlas for Urban Environment for City Planning

4. Achievements and future developments

Its achievements have been reflected to MLIT's Low Carbon City Development Guidance, city planning guidelines or UHI countermeasure plans of several local governments and a future image of a city by a local community development committee.

The future aim is to reflect in the guidelines for operation of city planning of MLIT and spread of the use of technologies which have been developed to promote countermeasures to be implemented effectively linked with low-carbon city planning.

[Reference]

1) Report on NILIM Project No. 20, Development of Synthetic Evaluation Technologies for Improving Urban Thermal Environment, January 2008
2) Technical Note of the NILIM, No. 583, High resolution numerical simulation on the urban heat island of the entire 23 wards of Tokyo using the earth simulator, March 2010