HARVARD
CENTER FOR GREEN
BUILDINGS AND CITIES

Decision-Making Support System for Designing High Performance Naturally Ventilated Buildings in Early Design Stages

PROBLEM

Energy consumption of the building and construction sectors accounts for around 30-40% of total primary energy use worldwide. Consequently, this sector contributes a great deal to energy pressures and other environmental issues such as greenhouse emissions and global warming. This dilemma has resulted in greater demand for buildings with higher energy performance, leaving designers with significant responsibility. Many agree that building performance should be taken into account throughout the design process, and as early as possible, to guide and inform design decisions.

Natural ventilation is one of the most promising methods to both reduce building energy consumption and improve environment thermal comfort level. However, due to the complexity of natural ventilation performance coupled with energy consumption, it is difficult to design a naturally ventilated building. This problem is even more complex during early design stages when information is limited.

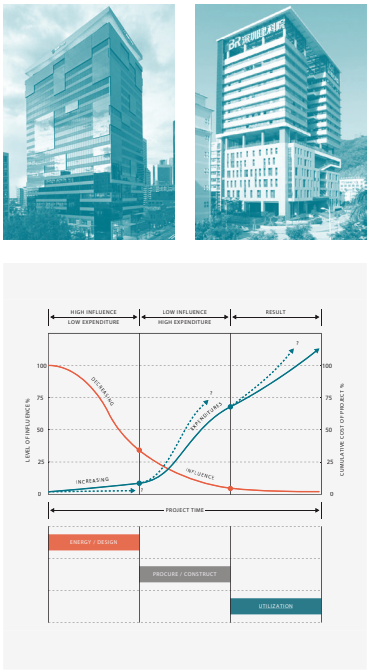

Figure 1. Natural ventilation as a method for reducing building energy consumption.

GUIDING QUESTIONS

Which index should be used to evaluate natural ventilation performance?

Which design characteristics should be considered in early design stage?

How could natural ventilation performance direct and inform the design within early stages?

PROJECT DESCRIPTION

This research aims to develop a design methodology to consider natural ventilation performance in early design stages. Through investigation of current natural ventilation studies and the special characteristics of design in early stages, an evaluation index of natural ventilation performance will be proposed, and a design decision-making support system for early design stages will be built.

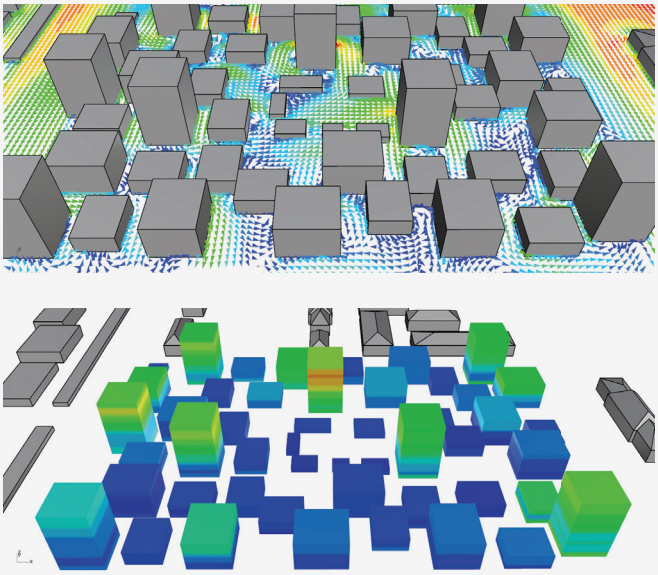

Figure 2. A system for a more informed design process.

IMPACT

The goal of this research is to provide a design decision-making support system for early design stages to promote a better, more informed design process, especially as it relates to natural ventilation performance.

Provide an evaluation index for natural ventilation performance in early design stages.

Develop a design decision-making support system to enable better design processes.

Contribute to shared knowledge of natural ventilation design guidelines.

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