



Tsuyoshi Setoguchi

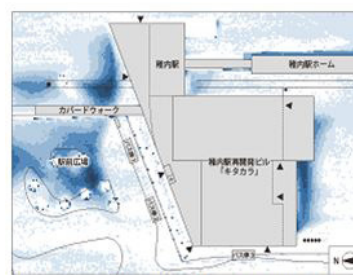
Hokkaido University, Japan

Architectural design with climate using snow and wind simulations to prevent from snowstorm in winter cities

Urban designs that should be symbiosis with regional environment and consider regional climatic conditions are one of the most important approaches for developing sustainable cities. Winter cities that suffer from heavy snow and cold winds in winter, an urban design approach different than that used for warm cities should be used. An urban design which reduces snow impacts is one of the most important approaches in heavy snow and cold climate cities. In this paper, the author evaluated the urban design for the new Wakkanai Station redevelopment project in Hokkaido, Japan. Wakkanai city is the northernmost city of Japan and located in a strong snowstorm area. A new design approach was required to be developed on the design process that should be combined architectural design and environmental engineering. From the architectural designing process, two types of alternative Wakkanai station design, the trapezoid type and the curved-surface type were addressed in the first stage. In next environmental engineering stage, both types were tested in snow simulations using a wind tunnel. Comparing those two types of design, the trapezoid type is better suited to alleviate the negative impact of snowdrifts on the pedestrian pathway. The formation of snowdrifts in the public areas is less likely to occur due to obstructions, and there is better access for passenger transfer and better approach for public bus and private vehicles. But some provision for the shelter of pedestrians from strong wind should be included in the redevelopment plan. The results of this environmental engineering stage were reflected to back the architectural design stage again in the Wakkanai station redevelopment project. Finally, the station design was decided and approved to the trapezoid type as the photo. Author developed the new urban design approaches with snow simulations. It might provide the most progressive design approach “design with engineering”.



Snow & wind simulations using wind tunnel



Results of the snow & wind simulations

Recent Publications

1. Zhiming Guo, Tsuyoshi Setoguchi, et al. (2018) Public open space design study on the basis of microclimate and spatial behavior in hot and cold weather conditions in downtown area. Modern Applied Science 12(2):128-141.
2. Norihiro Watanabe, Tsuyoshi Setoguchi, et al. (2017) Sustainable block design process for high-rise and high-density districts with snow and wind simulations for winter cities. Sustainability 9(11):2132.

3. Norihiro Watanabe, Tsuyoshi Setoguchi, et al. (2016) Urban-design process with snow and wind simulations - a study on the Kitami City Hall. Journal of Civil Engineering and Architecture 11(2):107-120.
4. Norihiro Watanabe, Tsuyoshi Setoguchi, et al. (2016) New city block design approaches incorporating environmental assessment for downtown districts in cities with severe winter climates. Journal of Asian Architecture and Building Engineering 15(3):455-462.
5. Tsuyoshi Setoguchi (2011) Public square design with snow and wind simulations using wind tunnel. INTECH, Wind Tunnels and Experimental Fluid Dynamic Research, 463-478.

Biography

Tsuyoshi Setoguchi is the Professor, Vice-Dean of Faculty of Engineering, Hokkaido University that is the northernmost major university in Japan. He has published more than 50 papers in reputed journals and got several prizes on these thesis as follows, Prize of Architectural Institute of Japan (AIJ) (2014), Prizes for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (2015) and Prize for Country development technology by Minister of Land, Infrastructure, Transport and Tourism (2016). He designed Wakkanai Station which is the northernmost station in Japan that prevent from snow and wind impact with his research technology.

setoro@eng.hokudai.ac.jp

Notes: