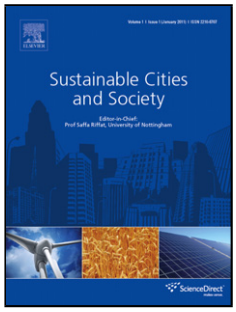

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PII: S2210-6707(17)30581-4
DOI: http://dx.doi.org/10.1016/j.scs.2017.08.026
Reference: SCS 745

To appear in:

Received date: 26-5-2017
Revised date: 6-8-2017
Accepted date: 23-8-2017

Please cite this article as: Wang, B., Cot, LD., Adolphe, L., & Geoffroy, S., Estimation of wind energy of a building with canopy roof.*Sustainable Cities and Society* http://dx.doi.org/10.1016/j.scs.2017.08.026

Estimation of wind energy of a building with canopy roof

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Highlights

- New propositions of wind potential evaluation indicators were given.
- Method of searching optimal form of a canopy roof for wind exploitation was given.
- Under the canopy there is hardly wind energy amplification effect.
- Mono-pitched canopies with small pitch angles show generally good wind concentration.
- Wind potential advantage appears under the roof of trough canopy and above the gable canopy.

Abstract

Wind energy development in the built environment can help to realise a sustainable city. In this paper, the wind energy over roof of a building with canopy roof was discussed. The method of evaluating wind potential over a building with canopy roof was presented. CFD parameter study was undertaken and validated by wind tunnel experiment before launch of the simulation. Several verification methods were discussed to help adjust parameter choice and to evaluate the simulation results.

We studied the capacity of wind concentration over roof of a reference building with different heights, overhangs and pitch angles of the canopy roof. A proposition of wind turbine position for maximum wind potential was then given for the chosen model building. The results show that, under the flat canopy there is hardly any wind energy amplification effect. Adding an overhang to a flat canopy in the upstream can have a slight improvement of wind concentration under the canopy but no concentration above it. The trough canopy models show wind potential advantage mainly under the canopy and the gable canopy models mainly above the canopy. The double-pitched canopy with a pitch angle of 20° was found to be the best one in wind concentration.

Keywords

Wind energy, CFD, wind concentration, canopy roof, building configuration.

1. Introduction

Development of renewable energy is an important solution to reduce the greenhouse gas, which is proved to contribute greatly to the present dramatic climate change problems. Wind energy is one of the oldest

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