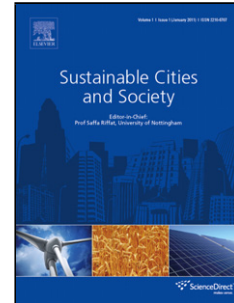


## Accepted Manuscript

Title: Location-Aware Multi-Objective Optimization for Energy Cost Management in Semi-Public Buildings using Thermal Discomfort Information

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## Highlights

Location-Aware Multi-Objective Optimization for Energy Cost Management in Semi-Public Buildings using Thermal Discomfort Information  
(Manuscript No.: SCS\_2017\_510)

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### Contributions:

1. We propose a location-aware adaptive optimization model, capable of delivering customized solutions in terms of thermal settings (user-centric or energy-cost centric) for semi-public buildings.
2. The mathematical model for energy cost is developed based on the non-linear relationship between cost and energy consumed. The model can accommodate location-dependent parameters such as energy pricing models adopted by local distributors, government regulations etc. In addition, the energy consumed is modelled in terms of heat load of the building, which takes into account the building structure-related parameters and hence, can be customized for any building of interest.
3. A customizable user comfort model is developed using the well-known Fanger's model. This model takes into account parameters such as user activity and clothing to determine user comfort.
4. This model enables the building operator to determine the operating temperature while fixing the highest acceptable (dis)comfort level or energy cost as per the set budget. It has the flexibility to incorporate additional energy load due to heavy equipment other than HVAC units in a building, seasonal changes in energy pricing models and occupancy. The flexibility of the model on location-specific energy tariff makes it conscious to a larger geographical region and its regulations.

### Results and Discussions:

We further elaborate on the contributions of the work in the Results and Discussion section (Manuscript Section 3). Semi-public buildings thrive on footfall and hence, it is important to the building operator to provide indoor comfort to users. Our solution will help building operators to minimize energy costs while maintaining user discomfort to a predetermined low value (Manuscript Section 3, Subsection 3.2). Since the solution takes into account the user activity, geo-local clothing preference and energy rates, user satisfaction level is expected to be high. To understand the trade-offs between the two conflicting objectives - energy cost and user (dis)comfort, we find the set of Pareto optimal solutions, also referred to as the Pareto frontier, for building-specific indoor environments (Manuscript Section 3, Subsection 3.4, paragraph 4). This will further enable the operators to determine the best combination of the aforementioned objectives with respect to the design variable, which is the desired thermal setting in this case.

The Results are based on the following:

1. Proposed Model versus Conventional HVAC Unit
2. Adaptability of Model to Comfort Requirement and Energy Budget

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