Research Summary: Identifying Stakeholders and Key Performance Indicators for District and Building Energy Performance Analysis

Yehong Li, James O'Donnell, Raúl García-Castroc, Sergio Vega-Sáncheza
Universidad Politécnica de Madrid, University College Dublin

Urban areas cover approximately 2% of the Earth's surface, but are responsible for almost 75% of overall resource consumption. The current process of rapid urbanization exerts additional pressure on energy resource supplies and increases CO2 emissions. As a result, urban energy planning and management will be pivotal for the realization of sustainable cities. Approximately 1/3 were built between 1970 and 1990 which corresponds with the initial implementation of energy policies. By improving the energy efficiency of existing buildings, total energy consumption could be reduced by 5–6%, and CO2 emissions by 5%.

Solutions that consider the energy efficiency of buildings in the context of community or district level can significantly contribute towards sustainable, smart cities. However, multi-level energy management that aims to improve energy efficiency on both the district and building scales is a complex information-driven process, requires stakeholder interaction through exchange and analysis of energy-related information.

Stakeholder involvement is a prerequisite for exchanging this information and promotion of integrated energy management. In order to manage this complexity, a method by which to identify the key stakeholders and extract salient information that addresses the stakeholders' performance goals is critical.

Approach

The systematic approach adopted in the paper to identify the stakeholders and the KPIs for multi-level energy management comprises a number of tasks that include:

- identification of stakeholders and their respective priorities;
- identification of Performance Indicators and the selection of Key Performance Indicators to ensure that goals can be measured and tracked;
- identification of the core important data in the overall data set (Master Data) and
- a review to identify performance problems and take measures for improvement.

Results & Analysis

This work demonstrates the feasibility of the proposed methodology for identifying key stakeholders and selecting KPIs that support multi-level performance analysis. 12 groups of stakeholders were identified, among which six groups were considered to be key stakeholders. Compared to current practice, which usually identifies stakeholders arbitrarily and presents them in a simple list, the proposed method provides an explicit evidence-based means to analyse stakeholders in accordance with different intervention points and various life cycle stages. Furthermore, the proposed approach illustrates identified stakeholders in a two-dimensional stakeholders' map (Figure 1). Analysis of stakeholders confirms that the use of intervention points facilitates identification of stakeholders' roles.

The results of the three indicators demonstrate the interrelationship between high-level (district)aggregated KPIs and low-level (dwelling) disaggregated KPIs. These indicators also illustrate the advantages of addressing performance problems at different levels in order to achieve stakeholders' performance goals.

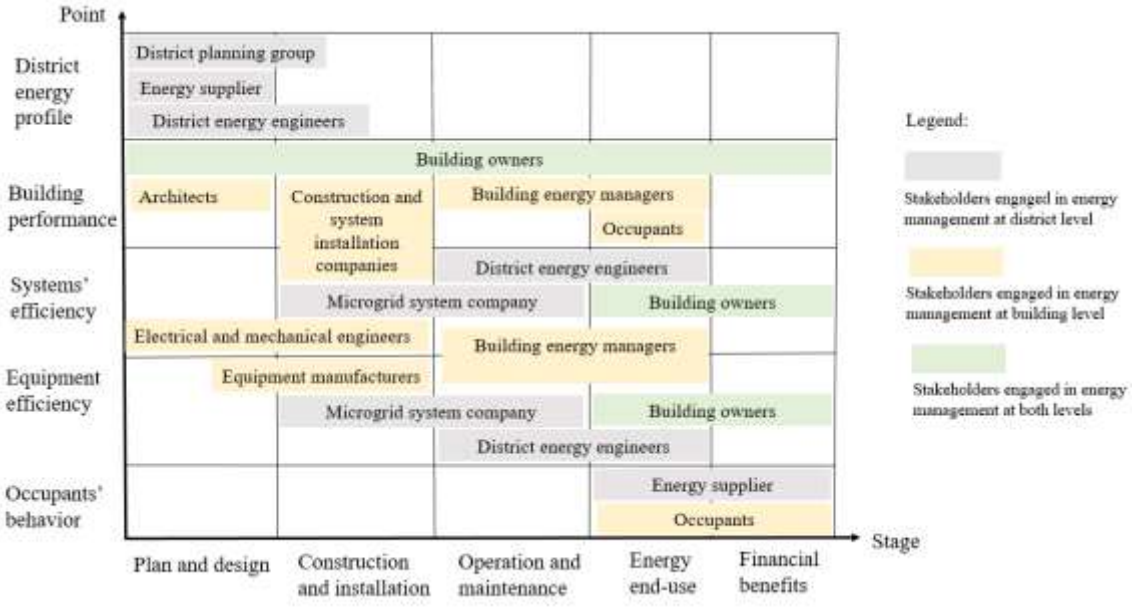

Figure 1: The internal stakeholders identified for energy management at the test case district.

Conclusions and future work

Integrated energy management at both the district and building level is a multi-stakeholder, cross-domain issue. There are many potential stakeholders and a vast amount of information involved. Stakeholders' engagement is of the utmost importance for enhanced energy management at district and building levels, since the distributed energy and information sources usually belong to different actors.

The identification of stakeholders and the determination of their prioritization will contribute to elucidate an appropriate, effective engagement mechanism among stakeholders for optimal decision-making in terms of energy performance improvement.

Sharing of multi-level key performance information between the identified stakeholders can enable a more thorough performance analysis and help to identify more profound energy performance problems.

The prioritization of stakeholders identifies key stakeholders who take precedence in decision-making, which further determines the KPIs that underpin the key performance goals.

The priority order in decision-making can effectively manage and obtain a trade-off between the needs of various stakeholders. This helps to rank the tasks for energy performance improvement according to their significance to the stakeholders.

Future work will focus on improving the proposed method in terms of stakeholders' prioritisation and developing an ontology to describe the interrelationship between different stakeholders, KPIs, and master data in order to facilitate the sharing and exploitation of the key performance information and master data gathered from various stakeholders.

Citation

This research summary highlights key findings from recent Energy Institute paper: Li, Yehong, James O'Donnell, Raúl García-Castro, and Sergio Vega-Sánchez. 'Identifying Stakeholders and Key Performance Indicators for District and Building Energy Performance Analysis'. *Energy and Buildings* 155 (15 November 2017): 1–15. https://doi.org/10.1016/j.enbuild.2017.09.003.