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A GAP ANALYSIS OF THE LITERATURE ON ENERGY-SAVING BEHAVIOURS IN THE COMMERCIAL SECTOR

Matthew Chester[1], Beth Karlin*[2], and Sea Rotmann[3]

See Change Institute
414 Rose Ave, Venice Beach, CA, USA 90291
web: https://www.seechangeinstitute.com
1: e-mail: mchester@seechangeinstitute.com
2: e-mail: bkarlin@seechangeinstitute.com
3: e-mail: sea@seechangeinstitute.com

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1. Introduction

As a means of enhancing sustainability, reducing demand on the power grid, and saving energy costs, influencing energy-saving behaviours (ESBs) have gained popularity in recent years. While enthusiasm stretches across stakeholder groups (e.g., utilities [1], policy makers [2], consumer groups [3], and more), action and attention have largely focused on the residential sector and are limited at best in both quantity and quality for the commercial sector. This disparity between effective identification, study, and promotion of ESBs in the residential vs. the commercial sectors suggests a potential opportunity for significant energy savings along with all their associated benefits if commercial sector ESBs receive increased attention and focus.

ESBs in the commercial sector come with inherent difficulties in defining the opportunity and identifying optimal measures according to the wide variety of commercial sub-sectors and actors engaged within those sub-sectors. This affects how the commercial sector as a whole is and should be treated for research and intervention purposes. These challenges explain, at least in part, why the commercial and residential sectors are treated quite differently regarding ESBs. In this paper, we provide a gap analysis of commercial energy behaviour literature and a call to action for addressing and overcoming them.

2. Methodology

The methodology for this work was a comprehensive, narrative literature review of primary and secondary literature on the topic of commercial energy behaviour from the last 15 years. Articles were identified via keyword search, outreach to professional networks, and backward / forward reference searches of key references. All articles were reviewed by one or more primary authors and coded for inclusion of specific commercial building types and energy saving behaviours. We then summarized findings into a summary report, which was delivered as a technical report to the study funders [4].

3. Findings

Overall, we identified three key gaps in the literature.

3.1. Generalization of Commercial Building Use

One evident trend was the tendency to treat the commercial sector as a single, homogeneous entity [5]. While the residential sector can reasonably be addressed holistically (even with differences in home and tenure types, general cross-over of ESBs applies across most households), the commercial sector is made up of too many unique types of buildings and business uses for such a one-size-fits-all strategy to be effective [6]. The diversity of the commercial sector and even the sub-sectors (e.g., fine dining will have different opportunities than fast food) makes it difficult to touch on all commercial building types at once, and addressing each unique sub-sector individually requires significantly more investment than simply tackling the more homogenous residential sector.

3.2. Overrepresentation of Research on Office Buildings

When available literature did drill down into specifics, most papers focused solely on office buildings [7]. While office buildings are ubiquitous and have many opportunities for energy-saving interventions, this focus overshadows significant opportunities that can be achieved in other commercial sub-sectors. While a smaller set of literature was found to address sub-sectors like hospitals [8], education [9], and retail [10], the availability of this literature was significantly less, the usefulness of the recommendations more questionable, and other areas of the commercial sector (e.g., food service, grocery stores, lodging, and many more) were left largely unexamined.

3.3. Focus on Equipment and Purchasing

When discussing specific ESBs, available literature tended to focus on upgrading equipment [11] and didn't dive into less obvious but just-as-critical energy-saving opportunities. The literature tended to overlook the opportunity for maintenance and curtailment behaviours, which are much less capital-intensive and can be implemented in between purchasing cycles [12]. When research did include non-purchasing behaviours, it tended towards a predefined set of assumed opportunities (e.g., lighting, computers, heating, and cooling) rather than studying what the ideal target behaviours -- especially moving beyond those surface level opportunities -- should be.

4. Conclusions and Recommendations

To realize the significant savings potential of commercial unexplored ESBs, additional research is needed. Rather than continuing to focus on the overall sector, we recommend significant investment into "small science" - numerous smaller and more focused studies on individual sub-sectors and/or ESBs within the commercial realm. Unfortunately, a one-size-fits-all approach will continue to neglect potential ESBs that are unique to hospitals, grocery stores, restaurants, dry cleaners, and the dozens (or hundreds) of other unique commercial building uses in the world. We encourage more funders to support this work and more researchers to undertake it because our planet is depending on it.

References

[1] Orlando Utilities Commission. *Large Offices*. Accessed at https://ouc.bizenergyadvisor.com/article/large-offices

[2] . ENERGY STAR. *Low- and no-cost energy-efficiency measures.* Accessed at https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy/stamp-out-energy-waste

[3] Sussman, R., and Chikumbo, M (2016). *Behavior Change Programs: Status and Impact*. American Council for an Energy-Efficient Economy. Accessed at https://www.aceee.org/sites/default/files/publications/researchreports/b1601.pdf

[4] Chester, M., Rotmann, S., Rosenstein, A. and B. Karlin (2020). *Commercial Energy Behaviour Opportunities Assessment.* See Change Institute Report #E2001. Los Angeles.

[5] Navigant (2016). *Meta-review of Behavior Based Energy-Savings Potential Estimates for Commercial Buildings*. BECC Conference. Accessed at https://beccconference.org/wp-content/uploads/2016/10/EhrhardtMartinez_meta-review_presentation.pdf

[6] Energy Information Administration. *Building Type Definitions, Commercial Buildings Energy Consumption Survey (CBECS)*. Accessed at https://www.eia.gov/consumption/commercial/building-type-definitions.php

[7] Environmental Protection (2017). *An ENergy Savings Checklist for Commercial Buildings*. Accessed at https://eponline.com/Articles/2017/06/19/An-Energy-Saving-Checklist-For-Commercial-Buildings.aspx?m=2&Page=1

[8] Garcia-Sanz-Calcedo, J. (2014). *ANalysis on energy efficiency in healthcare buildings.* J Healthc Eng. Accessed at https://pubmed.ncbi.nlm.nih.gov/25193373/

[9] G. Mylonas et al., "Addressing behavioral change towards energy efficiency in European educational buildings," 2017 Global Internet of Things Summit (GIoTS), Geneva, 2017, pp. 1-6, doi: 10.1109/GIOTS.2017.8016258.

[10] Kenington, David (2019), "Data for: Encouraging energy efficiency adoption in small businesses: A case-study investigation with independent retail", Mendeley Data, V1, doi: 10.17632/ckwps34mjs.1

[11] Fountaine, S. (2017) *Energy Saving Checklist for Commercial Buildings*. Accessed at https://biofriendlyplanet.com/eco-awareness/energy/energy-checklist-commercial-buildings/

[12] Talbot, J. (2014) *I WIll If You Will: A Replicable Strategy for Tenant Behavior Change*. American Counciel for an Energy-Efficient Economy. Accessed at https://www.aceee.org/files/proceedings/2014/data/papers/7-690.pdf#page=1

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