

# ***COMPLIANCE DECISIONS ON VOLUNTARY ENERGY CONSERVATION AGREEMENTS IN HONG KONG'S SHOPPING MALLS***

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## **Overview**

Mandatory laws and policies are critical in tackling energy and environmental problems. As large energy consumers, buildings attract significant attention for energy conservation. However, formal mandatory regulations often receive great resistance from various interest groups in the legislative processes. This research explores the application of an alternative, complementary policy instrument, particularly voluntary agreements. They require the voluntary collaboration of stakeholders, while mandatory regulations inherently put the polluters in confrontational positions against the government. However, the effectiveness of voluntary approaches could be seriously compromised because polluters are not obliged to participate and for those who do, the compliance rate may still be low. This paper aims to understand the compliance decisions on voluntary energy conservation agreements, particularly through examining key cost and benefit concerns in energy management.

## **Methods**

We choose to study shopping malls Hong Kong that are generally large in size and consume substantial amounts of energy. Furthermore, most of their indoor space is public space with numerous users, but the decisions relevant to energy consumption are generally under the managers of buildings rather than the users. Different from private space such as residential apartments or offices, third-party monitoring and verification are feasible in public space without intruding users' privacy to make the external voluntary enforcement of voluntary agreements possible.

This research examines four voluntary energy conservation agreements. They are (i) the 25.5 degree C Thermostat Setting Guideline for air conditioning, (ii) the delamp of indoor lighting, (iii) the Earth Hour as advocated by the World Wide Fund for Nature and (iv) the Voluntary Charter Scheme on External Lighting.

The research adopts a theoretical analysis framework from the crime and punishment literature (1-2). In explaining the compliance decisions, particular attention is paid to (i) the costs of participation in and compliance with a voluntary agreement, (ii) voluntary monitoring to detect non-compliance and (iii) the voluntary penalty of non-participation and non-compliance.

Field survey on shopping mall customers is the major method for data collection. Seven shopping malls were selected to cover three major geographic regions in Hong Kong (specifically Hong Kong island, Kowloon and New Territories), high and low-end malls, and both local residents and tourists. In order to control potentially influential factors, the survey in each shopping mall was conducted in both weekdays and weekends and the outside temperature also varied from day to day. A pilot study was first completed to polish the questionnaire design before a full-scale survey. Overall we have collected 1868 valid questionnaires in the formal survey through on-site face-to-face interactions from June to August 2015.

## **Results**

For indoor thermal comfort, a great majority of respondents (85.3%) were satisfied and significantly more people felt that the temperature was cool than others who felt warm. For those who were not satisfied, however, they were mainly complaining about warmth rather than coolness. Accordingly, customers overall had slight preference to cooler temperature than the neutral comfort level. Furthermore, their response to hotness and coldness showed statistically significant difference. Facing cold temperature, 44% of respondents chose to put on more clothes, while the option for taking off one was greatly constrained in summer. Instead, 19.6% consumers would vote with feet to leave the shopping mall if it were hot, while only 9.2% would do so if it were cold. Because customers have different thermal sensation, for any temperature level around the overall thermal comfort level, some will feel warm and some others will feel cool. The above research findings confirm that the first group has a higher weighting in the energy management decisions of shopping mall managers. Air conditioning thermostat will then be set a little lower than the neutral level. In comparison, respondents were very much insensitive to indoor darkness and brightness with almost identical responses. They also indicated largely universal satisfaction with indoor lighting in our pilot study

(correspondingly, the question was removed in the later formal survey). For external lighting, half of the respondents recognized its advertising effects. Considering the opportunity costs of advertisement in media or through other channels, shopping mall managers may well choose to pay for electricity to light external decoration and advertisement boards.

About 45% of the respondents found it difficult or very difficult to detect whether a shopping mall had been complying with voluntary energy conservation agreements, with little variation across the four. Only about 30% of respondents thought it easy or very easy. Whether shopping malls comply or do not comply with the four agreements had no difference for over 90% of the respondents on their decisions of future visits, while the remaining respondents were divided between more and less frequent visits.

The shopping mall customers could be distinguished into two major groups, local residents and tourists. 19% of all respondents were tourists. The ratio differed significantly across shopping malls, ranging from 42.4% to 1.3%. 80.1% of tourists came from Mainland China. Tourists tended to spend greatly more money and time in an average stay. Local residents and tourists had different thermal sensation of indoor temperature, probably due to their diverging expectation from life experiences. When dissatisfied with the indoor air temperature in a same shopping mall, tourists mainly felt too cold while local residents felt warm. In addition, 46.4% of local residents recognized the advertisement effects of external lighting, while 68.1% of tourists did. Their responses, however, are nearly the same when facing coldness and hotness, or darkness and brightness.

## Conclusions

The participation and compliance with the four voluntary energy conservation agreements could be properly explained with the research findings. The detection rates on whether shopping malls comply with the agreements and pontifical vote-with-feet penalties from customers are universally small to result in low expected benefits of compliance. The outcomes could be largely rooted in the expected costs of compliance. Due to the more negative response of customers who feel warm, shopping mall managers have a tendency to adjust air conditioning thermostat lower than neutral, while the 25.5 degree C guideline stays at the higher end of thermal comfort range. For the Voluntary Charter Scheme on External Lighting, the opportunity costs are significant as a result of the visible advertisement effects. Because the Earth Hour only lasts for one hour annually, the corresponding opportunity costs are minimal. The delamp of indoor lighting has not been widely promoted in Hong Kong as a voluntary energy conservation agreement, but could be effective due to the indifference between darkness and brightness within a certain range.

The number of tourists increased dramatically in the past decade. This trend could incur impacts to raise and reduce energy consumption in shopping malls' energy management. On the one hand, because tourists tend to have a preference toward higher indoor air temperature than local residents do, the changing composition of customers in shopping malls could lead to higher air conditioning thermostat setting and thus less energy consumption. On the other hand, tourists appreciate the advertisement effects of external lighting more than local residents do. Shopping malls will have stronger incentives to keep external lighting for attracting these high-spending customers.

Voluntary agreements on behaviours may accordingly have overall limited impacts on energy conservation, although the research identifies potential opportunities, such as on the delamp of indoor lighting. Because technological methods, for example using more energy-efficient equipments, do not compromise energy services and incur significant opportunity costs, corresponding voluntary agreements may have higher chances to become more receptive.

## References

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