

Barriers and Benefits of Changing People's Behavior Regarding Energy Saving of Air Conditioners at Home

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Received: August 3, 2017

Accepted: August 21, 2017

Online Published: September 28, 2017

doi:10.5539/ass.v13n10p130

URL: <https://doi.org/10.5539/ass.v13n10p130>

Abstract

Energy saving is a desirable behavior in terms of solving the global warming problem. In order to change people's behavior from the non-saving to the saving use of air conditioners, for example, the barriers to and benefits of changing their behavior should be investigated. This study collected data from four focus groups consisting of eight adults in each group. Two of the focus groups were non-energy savers in terms of their use of air conditioners while the other two focus groups were energy savers in their use of air conditioners. The results indicated that the barriers to energy saving behavior regarding air conditioners were comfort, habit, and privacy. The benefits of energy saving in relation to the use of air conditioners included saving money, alleviating the climate change situation, saving natural resources, behaving as a good role model for family members, gaining better health, and lengthening the life of the air conditioners.

Keywords: barrier, benefit, changing behavior, energy saving, air conditioner, home

1. Introduction

In 2011 in Thailand the primary energy supply was at about 128,092 ktoe, and an average growth rate of 6.74% per year was noted. The final energy consumption as seen in the economic, transportation, industrial, residential and agriculture sectors was 70,562 ktoe with an average growth rate of 5.35% per year. The sectors that demonstrated the most energy savings were the transport, industry and residential sectors, and in the residential sector, energy consumption was 11,040 ktoe, accounting for 15.6% of the final energy consumption in 2011. CO₂ emissions in Thailand's residential and building sectors were estimated to be approximately 7222 kt-CO₂ in 2011 at a 5.35% average annual growth rate (Kusumadewi & Limmeechokchai, 2015). Air conditioners, as everyone knows, are the electrical appliances, and they consume a great deal of energy. It has been estimated that in Bangkok's metropolitan area, for example, the electricity consumption of air conditioners in a house can cost from 34% to 59% of the person's electricity bill. Nakagami and Litt (1997) surveyed residential energy consumption and its indicators in 18 countries in both developed and developing countries and found that in Western countries household energy consumption showed a trend toward saturation; however, their study also found that it is likely that in Asian countries household energy consumption will continue to rise. Specifically in Thailand in 2000, the sale of air conditioners was 200,000 units and this rose to 3.4 million units in 2015, the equivalent of a 17 time increase just within 15 years. This naturally also leads to an increase in electricity usage there, and the use of electricity brings about undesirable emission and environmental effects. Again as everyone is likely to know nowadays (although some disagree), the existence of carbon emissions can lead to climate changes, which is a global issue that has mushroomed since 1992. There is of course a need to deal with this increasing environmental problem, and one way is to obtain a deeper understanding of energy saving behavior, and in the context of the present paper the focus is on air conditioners. It is the intention of this study to investigate some of the barriers that stand in the way that people save energy in their use of air conditioners, and well as some of the benefits underlying the motivation of people to save energy in that use. These behaviors include buying advanced energy-saving air conditioners, the day-to-day behaviors in using air conditioners, and maintenance behaviors in relation to the use and care for air conditioners.

2. Literature Review

2.1 Views of Barriers and Benefits of Human Behaviors

Traditional economic exchange theory suggests that in order for exchange to take place, people must perceive

benefits that are equal to or greater than the perceived costs; that is, people must feel that they will receive more than they have given. In order for the development of effective behavioral change strategies to be effective, it has been suggested that it is essential to know what barriers or perceived “costs” exist in relation to the adoption of a certain behavior, and what benefits that people feel they will receive or what would motivate them to change their behavior. Further, it has been suggested, by McKenzie-Mohr et al., 1995; Tabanico & Schultz, 2008, for example, that these barriers and benefits often differ according to the behavior of the person being investigated. Doug McKenzie-Mohr and Schultz (2014) for example discussed the idea that barriers can be seen as both internal and external to the individual, such as lack of the knowledge or skills needed to carry out an activity in the first case, or regarding the structural changes that need to exist in order for the behavior to be more convenient in the latter case. These authors also stressed that barriers will differ according to the target audience and behavior.

It has also been noted that barriers are often related to a variety of factors, including knowledge, beliefs, skills, abilities, infrastructures, technology, economic status, or cultural influences, and they may be real or perceived; an example of the former instance is the perception that joining a car pool and riding to work with others would take too much time, and in the latter instance, for example, it is thought that people that participate in car pools really do not have enough money to buy their own car. In either case, the perspective is that of the target audience (Lee & Kotler, 2016).

Benefits can be seen as something that the target audience wants or needs, and for that reason the members of that audience value the commodity and the behavior that will lead to the acquisition of the commodity (Kotler & Lee, 2006). Hamilton Carvalho, in a 2014, a social marketer in Brazil, created a checklist of what he considered to be fundamental human needs and what people would consider as offering the desired benefit. They were (a) autonomy, (b) competence, (c) belonging, (d) meaning, (e) identity, (f) justice, (g) positive emotion, and (h) cognitive economy (Lee & Kotler, 2016).

2.2 Benefits of High Technology Air Conditioners

According to UNEP (2017), air conditioners today are more efficient than in the past; that is, they are often 50% more efficient than many of the products in the global market. Refrigerants are available in the global market today that are to a greater extent than in the past friendly to the environment and have a lower global warming potential (GWP). If the transition was made to energy- and climate-friendly air conditioners, it would have a significant impact on the environment in terms of power demand, the growth of global energy, and the avoidance of the leakage of high-GWP refrigerants, thus leading to the reduction of greenhouse gas emissions and other pollutants. Such a transition would also lead to other social, economic, and environmental benefits such as, one’s annual energy savings (electricity consumption). According to UNEP (2017), an estimated 620 Twh/year of electricity can be saved by 2030 if the best currently-available technology for air conditioning is adopted. Another benefit would be lower emissions; that is, improving air conditioning efficiency (~30% more efficient than the current technology) along with the use of low-GWP refrigerants could avoid up to 480 megatonnes of CO₂ in 2030, according to the UNEP (2017). Finally, this transition would lead to substantial financial savings. For example it has been estimated by UNEP (2017) that up to \$56 billion (\$17 billion just for India) could be saved for consumers by 2030 through the improvement of policies regarding efficient air conditioning.

3. Methodology

Thirty-two adults aged at least 18 years living in Bangkok were randomly recruited to participate in the four focus groups with eight persons in each group. There were two groups consisting of people that were not energy savers in their use of air conditioners at home whereas the other two groups consisted of people that were energy savers in this context. The energy saving and non-energy saving participants were all self-identified. It is noteworthy that there were no mixed groups between the energy savers and the non-energy savers because mixing those that are active and inactive in the same focus group can significantly affect the quality of the information received from those that are inactive. That is, when someone is not yet engaging in a certain behavior, such as biking to work, they can feel quite uncomfortable participating in a focus group with others that are (McKenzie-Mohr, 2011). In this way, altogether there were sixteen persons that were non-energy savers and an equal number of energy savers. On average, each focus group lasted about one hour.

The study purposely selected males and females in equal number (Table 1). The non-energy savers were a bit younger than the energy savers. Most of the people in both groups had never been married. The non-energy savers tended to have a lower education but a higher monthly household income than the energy savers. All of the non-energy savers were employed whereas one of the energy savers was a housewife and another was a student. The non-energy savers tended to be administrators and professionals and employees in private business

as well as one in a government office, whereas the energy savers were working only as administrators and professionals and employees in private business.

Table 1. Profile of non-energy savers and energy savers in the use of air conditioners

Demographic Characteristics	Non-energy saver (%)	Energy saver (%)	Total (%)
<i>Gender</i>			
Male	50	50	50
Female	50	50	50
<i>Age</i>			
	27 years	31 years	29 years
<i>Marital Status</i>			
Married	6	13	9
Never married	94	88	91
<i>Education</i>			
Less than bachelor degree	0	0	0
Bachelor degree	94	81	88
Advanced degree	6	19	13
<i>Employment status</i>			
Employed	100	88	94
Unemployed	0	0	0
Housewife	0	6	3
Student	0	6	3
<i>Occupation</i>			
Administrator or Professional	19	14	17
Government officer	6	0	3
Employee in a private business	63	71	67
Others	13	14	13
Number of household members	3.8	3.7	3.75
Number of household members who have income	3.4	2.6	3
Monthly household income (Baht) (1 Baht=.03 USD)			
Less than 20,000	0	25	13
20,000 – 29,999	6	0	3
30,000 – 39,999	0	0	0
40,000 – 49,999	13	6	9
50,000 – 59,999	6	6	6
60,000 – 69,999	13	0	6
70,000 – 79,999	0	6	3
80,000 – 89,999	13	19	16
90,000 – 99,999	13	6	9
100,000 or more	38	31	34

4. Results

4.1 For the non-energy saver groups of air conditioners, the following was asked:

4.1.1 What were the signs or indicators that you did not save energy in your use of air conditioners?

There were many signs or indicators of non-energy saving behaviors. These included switching on air conditioners as soon as a few people arrived in the home and leaving the air conditioners on even when the people went to do other things. One participant that had different activities with her family members turned on the air conditioner in different rooms. Another participant turned on the air conditioner all the time when she was at home even though she had to use a blanket while she was sleeping. Another lady switched on the air conditioner regardless of the season, whether it was the summer or rainy season; she could not sleep if she did not turn on the air conditioner. Another gentleman had to start the air conditioner with a low temperature, for instance, 18 degrees C., for the room to be cooled quickly before adjusting the temperature up. One participant thought that her electricity bill was quite high as compared to others. It was 3,000 to 4,000 Baht/month for four

persons. Another participant turned on the air conditioners as a habit and used them until they were broken. He would not change to a new one even though he thought that the new air conditioner with modern technology would help save energy. One gentleman said that he used the air conditioners every day. He added that he used them in a way that was appropriate with his status. He thought that it was not overspending because he could afford it. He spent only, according to him, 2,000 to 3,000 Baht/month for two persons. Another female participant did not take care of her air conditioner well. She would wait until the water dripped from it before she would have it cleaned.

4.1.2 What were the barriers that preventing you from saving energy regarding your use of air conditioners?

Some of the participants mentioned that it was a comfort. One gentleman said:

“The weather in Thailand is very hot. Staying on the second floor in the afternoon would be hotter than on the first floor. I have to turn on the air conditioner all the time even adjusting it to a low temperature just for the sake of comfort.”

Several other participants thought that it was a habit. One lady stated:

“It is my habit. I like to be in a cool place. I have to switch on the air conditioner no matter what kind of weather it is, even in winter.”

A few other participants answered that it was a matter of privacy. One lady said:

“I need privacy. I do not need to be disturbed by any noise. That is why I turn on the air conditioner.”

4.1.3 What were the other factors that prevented you from saving energy in your use of air conditioners?

Some external factors that prevented the participants from saving energy in their use of air conditioners were the norm. Specifically, one gentleman said that it was the normal practice of others who usually slept in air conditioned rooms. Another lady wanted to leave her air conditioner on for the comfort of her dog.

4.1.4 Do you want to change your behavior from non-energy saving with regard to the use of air conditioners to energy saving? Why or why not?

Half of the non-energy savers wanted to become energy savers. The main reason for this change in behavior was the money savings for the person paying the electricity bill, whether it was themselves or their parents. Another reason was to help solve the global warming problem. Some other reasons for this change of behavior were helping Thailand save energy and prolonging the life of the air conditioners through proper cleaning.

The other half of the non-energy savers did not want to become energy savers. The main reason for this was because the electricity bill was not too high; they could afford it. One female participant gave a noteworthy comment—that she could not bear the heat. In addition, she was not the one that paid the electricity bill; her brother paid for it and he also used the air conditioners to the same extent.

4.1.5 The question for the participants that wanted to change their behavior from being a non-energy saver to an energy saver was the following: What were the behaviors that you want to change?

A few of the participants wanted to turn on their air conditioner for a certain period of time, for instance, during sleep time. On the other hand, another participant wanted to switch off the air conditioner while sleeping and use the electric fan instead. Another lady wanted to switch off the air conditioner more quickly than she used to after going to sleep. Another participant intended to turn off the air conditioners whenever they were not in use, for instance, when one wanted to go shopping. One lady wanted to set up a time for using the air conditioners in order to solve the problem of forgetting. Another one wanted to clean her air conditioner more often because of the shortened life of the air conditioner due to the obstructions in the air conditioner by cat hairs. One noteworthy comment from a participant was that she wanted to change her air conditioner to a new one with an intelligent feature for saving energy.

4.1.6 For the participants that did not want to change their behavior from non-energy savers to energy savers, the following was asked: What can stimulate you to save energy?

A male participant thought that it would be an increase in the cost of electricity. At the moment he had to pay around 800 Baht/month after sharing the electricity with two other people. If he had to pay 1,000 Baht/month, he

might start to save energy. One female participant wanted to save energy during the month that she bought a big ticket item. Another gentleman mentioned that other persons at home had a lot of influence on him. He added that if other family members saved energy, he would go along with it. Otherwise, it was useless for him to be the only one at home who saved energy. Another lady said that in her case she would save energy when her older brother who paid the electricity bill complained. One participant stated that moving upcountry, which was cooler, would encourage him to save energy. Another person mentioned that an energy saving campaign for air conditioners by the government pointed out the problem of using air conditioners as a cause of climate change in the world and this stimulated his energy saving behavior.

4.1.7 Have you thought about changing your air conditioner to a high-technology, energy-saving model?

Several participants did not want to change their air conditioners to new high-technology models. They wanted to use the same old ones until their air conditioners no longer worked. Several others already had the air conditioners that came with their home when they bought it, whether it was a house, a condominium, or a townhome. For one participant the air conditioners came with the rented room. A few participants did not choose the air conditioners on their own; their parents were the decision makers in this regard. One participant helped his father buy the air conditioner by searching on the Internet for the estimated annual electricity payment and the price of the air conditioner. If the price of the new high-tech air conditioner was not very different from the normal model, let's say it was 2,000 Baht, it would be all right for him to suggest to his father to buy that version. One gentleman pointed out that if his old air conditioner did not work in the future, he would buy a new energy-saving model at that time by asking the salesperson. One lady said that she had changed all of the air conditioners in her house to the newer, high-tech models with the label no. 5 (an indicator of energy savings issued by the Electrical Generating Authority of Thailand). Another lady added that she changed the air conditioner because the advertising mentioned that label no. 5 was a symbol of energy saving. She went further and said that she thought that it was a long-term investment. She had to invest a large amount of money upfront at one time but she could save a lot per month. One gentleman mentioned that he decided to change the air conditioner after it had been used for 20 years. It consumed a lot of energy and could not make the room cool. He expected that the cooling power of the new air conditioner would increase and that the energy consumption would decrease; however, his first criterion for buying the new air conditioner was the price, followed by the energy-saving feature that came with the interesting brand names along with other detailed features.

4.2 For the group of individuals that attempted to save energy in their use of their air conditioner, the following was asked:

4.2.1 What were the indicators that you saved energy on your air conditioner?

Many of the participants saved energy in their use of the air conditioner by setting a time to turn it off. A few of the participants also set a time to turn it on; and a few others set the temperature to be 25 degree C. or a bit higher up to 27 degrees C. Some others switched on the air conditioners only when it was really warm or when they were sleeping. A few others had their air conditioners cleaned a few times a year. Some other energy-saving behaviors included moving to the same room as one's parents during the night or leaving the house so they would not have to use the air conditioner. One housewife happened to renovate her home and took a chance of installing insulation under the roof as well as changing her air conditioners to be new, high-tech models.

4.2.2 What are the benefits of energy saving with air conditioners?

Almost all of the participants thought that the energy saving from their use of air conditioners helped them to save money. One female participant stated:

“After I save money from the air conditioner, I can spend it on other things.”

Many other participants agreed to save energy because it helped them to solve the global warming problem. A few participants did that because they wanted to save the natural resources. At this point, one participant added that in doing so Thailand could import less energy. A few others wanted to be good role models for other family members, and some others thought that using air conditioners less often would bring about a better health condition because of better ventilation and less dry skin. Additionally, a few of the participants mentioned that using the air conditioner less often would make them last longer.

4.2.3 Would you like to save even more energy in your use of air conditioners?

Twelve of the participants wanted to save more energy in their use of air conditioners while four of them did not.

4.2.4 How do you want to save more energy in your use of air conditioners?

The main strategy for saving more energy in the use of air conditioners was changing the temperature setting from 25 degrees C. to 27 degrees C., as well as using the electric fan at the same time. Another strategy was to set the turn-off time for the air conditioner one or two hours earlier during the night. Additionally, one participant wanted to plant trees in order to create a cooler environment because she had space to do so. It was noteworthy that a few participants wanted to save more energy in their use of air conditioners but did not know how.

5. Discussion

In general, promoting energy-saving behaviors in the use of air conditioners involves several parties, including the public and private sectors. Money saving is the main concern in this context. The finding in this study is in line with that of Aravena et al., 2016. It follows that the government should have a better way to provide feedback about electricity costs to the citizens. This could be done through smart meters that can provide the real time cost of the electricity as well as past records of electricity payment for people. If the government fails to do so, it can be an opportunity of the private sector to step in to build smart homes with energy monitoring and management systems. In addition, generally, the government should launch campaigns to alert people to fight the global warming problem. Specifically, the government should inform the general public about the proper ways of energy saving in their use of air conditioners through various means, whether it be the mass media or the new media.

What the companies can do to promote energy saving in the use of air conditioners is to invent new products with better technology for energy saving. The new air conditioner should also require less maintenance, have longer life “spans,” and be less expensive so that lower income groups can be reached. Additionally, corporations can also provide trade-in options for new air conditioners with better technology for energy saving.

In particular, to change people’s behavior from being non-energy savers in the use of air conditioners to energy savers, the focus should be on the proper maintenance behaviors of the non-energy savers. This means that the non-energy savers should be informed that they should clean the filters of the air conditioners approximately once a month and have a big cleaning of the air conditioners by a technician a few times a year.

6. Conclusion

The main barriers to energy saving in the use of air conditioners by non-energy savers are comfort, habit, and privacy. Half of the non-energy savers want to become energy savers mainly because it would help them to save money. It is noteworthy that the money saving motivation for residential energy saving behavior is similar to the result from the study of Aravena et al., 2016. The other half of the non-energy savers in this study did not want to be energy savers basically because they could afford to pay the electricity bill. The revealed benefits of saving energy in the use of air conditioners for the energy savers were saving money, helping to alleviate the climate change situation, saving natural resources, behaving as a good role model for family members, gaining better health, and lengthening the life of the air conditioner. Twelve out of sixteen participants wanted to save more energy in their use of their conditioners. Neither the non-energy savers nor the energy savers wanted to change their air conditioners to the new higher-tech models that consume less energy until the old ones no longer work.

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