The Dynamics of Changing Japanese Energy Consumption Patterns and their Implications for Sustainable Consumption

Harold Wilhite, Ressurskonsult
Hidetoshi Nakagami and Chiharu Murakoshi, Jyukankyo Research Institute

What is behind significant shifts in energy consumption patterns? This is a critical question for both researchers interested in the dynamics of change and for policy makers interested in influencing consumption patterns. Changing Japanese air conditioning and heating patterns yield insights on the dynamics of change. There has been a 50-fold increase in the installation of air conditioners in Japanese residences in less than 30 years, as well as an increase in their time of use. There is also a rapid change going on in the way that Japanese households heat their dwellings. Traditional '*kotatsu*' person heaters are being supplemented by or replaced with space heaters. A recent ethnographic study in Fukuoka sheds some light on cultural and lifestyle factors behind the changes. In this paper the authors use national data on energy consumption, recent survey data, results from the ethnographic study and an analysis of air conditioning advertising to analyze changes in these space heat and cooling patterns. We reflect on which factors and forces in the society are behind the changes. Economic factors contribute but are not the whole explanation. Social and cultural changes play an important role, including changes in material norms, work and home use patterns, changing family interaction and changing folk theories of what it is to be modern, influenced by media and advertising. These forces for change are relevant not just for energy consumption, but for consumption of other material-derived services in home. The symbolic association of material modernity and modern lifestyle generate a constant undertow of change in the direction of increased demand for services and away from achievement of sustainable consumption. We use an analogy from energy consumption and conservation analysis to draw out some of the challenges facing policy efforts to achieve sustainable consumption.

INTRODUCTION

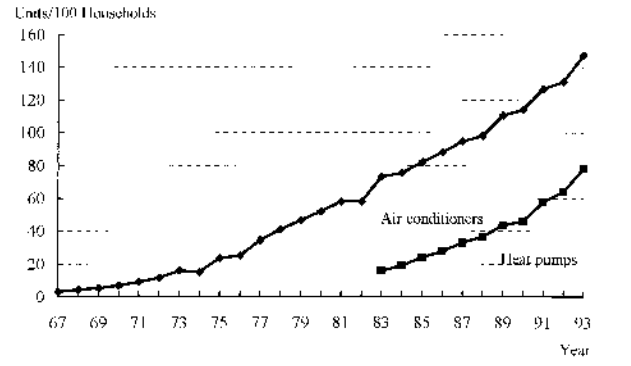
What is behind significant shifts in energy consumption patterns? This is a critical question for both researchers interested in the dynamics of change and for policy makers interested in influencing consumption patterns. Japanese air conditioning and heating patterns are examples of consumption patterns which are in the process of significant change. In this paper we discuss trends in space cooling and space heating, based on national and regional survey data and on an ethnographic study of household energy use in Fukuoka. Ninety minute open-ended interviews were done with 16 households in their homes in 1994.[1] The depth of information obtained in the interviews provided a basis for an analysis and interpretation of complex culture-based household consumption patterns. We use information from the ethnographic study and a review of air conditioning advertising as a point of departure for an analysis of why consumption patterns are changing. We then discuss how these findings might contribute to the discussion of a conceptual framework for 'sustainable consumption', an issue on the agenda of several international organizations, including the Commission for Sustainable Development, the United Nations and the OECD, as well as on the national policy agendas in the United States and several European countries.

SPACE COOLING

Evidence for Changing Use Patterns

Figure 1 shows the dramatic increase in the installation of air conditioners in Japanese residences over time. From a level of 3 air conditioners per 100 households in 1967, the numbers had increased to 100 per 100 households by 1988,

Figure 1. *Diffusion of air conditioners in Japan*



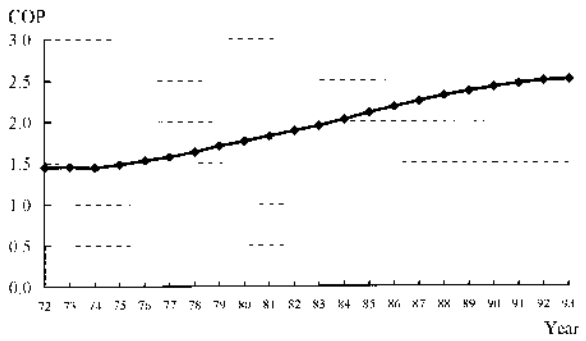
SOURCE: Economic Planning Agency (1993)

and 150 per 100 households in 1993, a fifty fold increase in less than 30 years.

Over the same period, there have been significant improvements in the energy efficiency of air conditioners (figure 2). Improvements can be attributed to technical innovations such as the electronic, variable speed air conditioner (1981) and the heat pump (1982). Efficiency standards, implemented in 1984, have stimulated improvements in efficiency (Nakagami 1994).

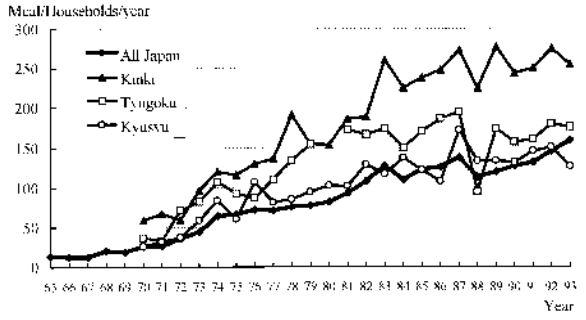
The efficiency gains have far from offset the growth in total energy use due to diffusion of air conditioners and increases in running time. Thus there has been a huge growth in weather adjusted energy consumption for residential space cooling over the past 25 years, illustrated in figure 3. This growth has contributed to the necessity for new power plants to meet ever increasing peak loads (figure 4) and to environmental problems by contributing to increased CO2 emissions and nuclear waste. There are reasons for energy and environmental policy makers to be concerned with this trend, especially since rural areas still lag behind urban in air conditioning saturation and air conditioner efficiency may be approaching a technical limit (in figure 3, compare Kinki and Tyuugoku, two regions adjacent to one another, the first urban (Osaka) and the second rural—Kinki uses about 50% more energy per household for space cooling than does Tyuugoku). From the perspective of sustainable consumption, the changes in consumption of artificial cooling provides an interesting case in which the variables of life quality, consumption pattern and environmental consequences can be discussed.

Figure 2. *Energy efficiency of air conditioners in Japan*



SOURCE: Jyukankyo Research Institute (1995)

Figure 3. *Energy consumption for space cooling (weather adjusted) in Japan*



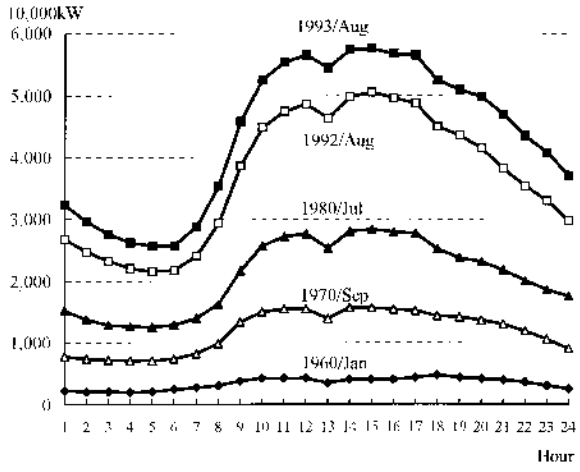
SOURCE: Residential Energy Statistics Yearbook Japan (1994)

Factors Behind the Changes in Cooling Consumption Patterns

An analysis of national demographic data and information from the ethnographic study point to these as the major change factors: wealthier households, changing building designs, and changing culture of the home.

Economic Factors. Some of the change can be accounted for by economic variables. Disposable household income doubled from 1974 to 1984 (then slowed to about 2% per year over the last decade). Prices for air conditioners rose at the same pace as the rise of the consumer price index (CPI) until around 1986, then began to fall and are today

Figure 4. *Load curve at annual peak day for Tokyo Electric Power Company*



SOURCE: TEPCO (1992)

20% cheaper on average than they were in 1986. Electricity prices have not changed much since 1980. Thus households have gotten richer, while both the price tag and the running costs for air-conditioners have declined somewhat. This sheds some light on increases in use of air conditioning, but is by no means the whole explanation for the 50 fold increase.

Changing Building Design. The traditional Japanese home differs in a number of ways from the modern North American and European home. The typical traditional building is designed to capture passive solar heat in the winter, while low overhanging roofs and shutters provide shade in the summer time. With the exception of the northern province of Hokkaido, the traditional building shell is not well insulated. Houses are designed to provide effective natural ventilation in the summer months which can be regulated through opening and closing sliding panel doors in both the building's shell and between rooms.

In the 1950's and 1960's, building practices began to change, emulating North American building styles. Today, in Tokyo and other large and medium-sized cities like Fukuoka (population about 1 million), traditional houses are the exception rather than the norm. Modern homes and apartments do not take advantage of natural ventilation. The large majority do not use shading and other traditional ventilation methods. These changes in building styles have made artificial cooling a necessity for many homes, especially in urban areas.

The Changing Culture of the Home. The layout, appliances and activities in the traditional Japanese home differ in a number of ways from the Western equivalents. Cooking, bathing, clothes washing, dish washing are all different from the typical Western style. Many traditional appliances are also different, including bathtubs, toilets, kitchen equipment and heating equipment.

Western styles began to influence Japanese residences on a large scale in the 1950's. By 1955, so-called 'corporation' apartments became popular. These had Western bathrooms and kitchens. Virtually all of the major modern appliances were introduced in the 1950's and early 1960's (refrigerator 1950; vertical drum washing machine 1950; black and white television 1952; cylinder-type vacuum cleaner 1953; transistor radio 1956; color television, juicer, electric blanket, steam iron 1960; dishwasher and microwave 1961) (Nakagami 1994). Domestic production of air conditioners was started in 1952, but the air conditioner did not penetrate the home market until the early 1970's.

As of today, Western-style appliances and practices have replaced their traditional Japanese equivalents for many activities in the home. Three exceptions are space heating (though practices are in transition, discussed below), bathing and lighting practices. The resistance to change of the latter two can be related to their cultural significance.[2]

The Air Conditioner as Symbol. A widely shared mental model concerning artificially cooled air is that it is bad for the health. The fact that air conditioner diffusion and use has increased in the face of this 'folk theory' makes it even more interesting. There is evidence from the ethnographic study that the rapidity of the change has been accelerated by the evolution of a new 'folk theory' concerning the air conditioner: those who do not have one are either backward, poor or overly frugal. In the ethnographic study, we found evidence that the pressure to avoid these labels affects not only apartment dwellers, but also occupants of traditional dwellings with effective natural cooling.

We found that 14 of 16 families in the study had at least one air conditioner. The 2 families without air conditioners both drew attention to social pressures on them to install air conditioners. Of those that had them, half expressed that in the past they had used them sparingly because they felt that too much artificial air was unhealthy. All 14 of them, however, were extending the hours which they were using air conditioning. The initiative for extended use came most often from the male adult in the household. We hypothesize that this could be due to an acclimatization to artificial cooling in offices and commutes (air conditioned subways, buses and cars), where men in our sample spent on average 12.6 hours per day.[3]

One of the households provides a case which clearly shows the symbolic power which the air conditioner has assumed. An older couple in the study who lived in a traditional Japanese house expressed exasperation with the fact that their daughter (who had moved away from home) kept pressing them to buy an air conditioner. The adult children in Japanese families feel a strong filial responsibility to take care of their parents. In this case, the parents communicated to the daughter repeatedly that they were comfortable with the natural cooling the home's design provided. They were proud of their traditional home and expressed concern about the aesthetic damage which would accrue from putting an air conditioner in the wall of their living room. The daughter was well aware of her parents objections, but according to the parents, she was unstoppable. It was clear to both her parents and to us that her motive was not to increase her parent's physical comfort. The daughter wanted her parents to install an air conditioner in order to provide evidence to friends and neighbors that she was exercising her filial responsibility.

This and other examples from our study draw attention to the increasingly symbolic nature of the air conditioner. It is a symbol of modernity, well-being and success. Air conditioning is increasing in the face of traditional notions of

aesthetics and folk norms about health, which underscores the power of the social-psychological forces involved. People are buying air conditioners to satisfy a number of goals. Increased comfort is only one of them. This is an important point for our approach to the analysis of product adoption. These social pressures are not accounted for in traditional economic analysis, which assumes that consumers choose things based on whether it will improve their life quality or lifestyle.

The Role of Advertising. Rigorous marketing has contributed to both the physical and symbolic changes associated with air conditioning penetration. In order to get an idea of what symbols have been promoted in advertising over the years, we analyzed a comprehensive sampling of Mitsubishi print advertising over the period from 1965-1995. We analyzed both the text and images used in the advertisements, looking at the messages conveyed by both.[4]

In the text, there are two dominant topics which have been emphasized consistently throughout the entire period. The first is simply that the air conditioner makes the home's interior, and the persons occupying it, more comfortable. The second is an emphasis on a succession of technical advancements, from the simple miracle of the air conditioner itself in the 1960's, to the development of timers, remote control, combined heater/a/c. units, the 'double fan', the 'quick start' and so on as time goes on. This played into the popular theme of that and successive periods, associating technical progress with a better life.

A topic which dominated from 1965-1978 was the message that the air conditioner would not clash with the aesthetics of the traditional home environment. It would be quiet and compact. You could have your home just as before, but it would be cooler. This was followed up with a different angle on the same theme in the period 1975-1995, which emphasized control and convenience with the use of remotes and timers.[5]

An examination of the images (pictures and drawings) in these advertisements, reveals that an important initial strategy was to portray that the air conditioner could be unobtrusively adapted to a traditional dwelling and lifestyle. One image very early (1967) was representative. It showed an air conditioner in the background of a traditional Japanese living room, with a woman wearing a kimono kneeling in the foreground. Everything in the image represents the traditional Japanese home except the air conditioner.

This strategy changed about 1970, when images began to be used which associated the air conditioner with a modern, Western lifestyle and interior decor. This image was used consistently until 1990 (with the exception of a few years in the mid-1970's). The dress and activities of the Japanese people in the advertisements over this 20 year period are all Western. The home interiors shown are ultra modern, even by Western standards. They show only Western furniture, appliances and room furnishings. In one example from 1980, an air conditioner hums in the background of a Western sitting room, the prominent objects in the foreground being a bottle of whiskey, a bucket of ice and cocktail glasses on the coffee table, all of which are extremely foreign to traditional Japanese notions of relaxing or entertaining.

Apart from the non-obtrusive and Western-modern image, only two other images appear with any regularity. One is the association of the air conditioner with cool, mountainous outdoor scenes. A related set of images associate the air conditioner with a healthy household, perhaps a conscious strategy to combat the folk theory which contends the opposite. These natural, health oriented images appear in the period 1965-71. Another image which has been used in subsequent years shows how air conditioners contribute to a cozy home. People in these advertisements are shown in casual clothes and relaxed settings, presumably made possible by the air conditioner in the background.

To sum up, one can divide the messages conveyed by advertising over the years into two categories. The first category emphasizes the physical rewards and convenience, including the increased physical comfort; a 'healthy' inner environment; and the compact, quiet, unobtrusive nature of the technology. These themes have been emphasized regularly over the 30 year period. The second category consists of images of a more symbolic nature: technical progress, modernity and coziness. The air conditioner is consistently portrayed as a dynamic, powerful (a word used often in the text) technology becoming ever more advanced and sophisticated. Since about 1970, the manufacturer has put an enormous effort into placing the air conditioner squarely in the category of things which characterize the modern home and household, the images of which until 1990 are strictly Western. In the last few years, Western style material modernity has been replaced by coziness, with the air conditioner making it possible to for people to lounge and relax in their homes.

We have not looked into other forums for advertising such as television and other print media, but suspect we would find evidence of variants of these marketing strategies. We have no measure of how much impact these have had on people's attitude to air conditioning, or to their willingness to buy. The sophistication and subtlety of the messages are undeniable, however, and it is evident from our ethnographic study that the symbolic associations made by those in our sample parallel those made in the advertisements.

SPACE HEAT

The hardware and use patterns behind space heat are also changing in Japan, and provide another window on the factors behind consumption changes.

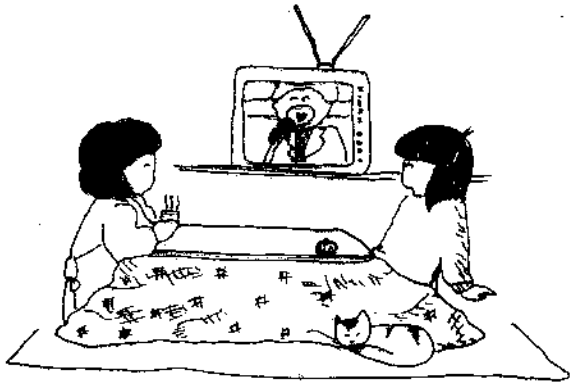
The idea of space heating was completely foreign to most Japanese until the 1960's (Nakagami 1994). Prior to that time, heat was provided to the home by a single '*kotatsu*', a coal-fired, kerosene, or later electric heater, placed under the table in the living/dining area of the house. Families would spend much of the evening eating and socializing around the *kotatsu*. They would then proceed from the *kotatsu* to the hot bath, and from there into bed.

In the past 30 years there has been a gradual shift from body heating to space heating, accomplished with electric carpets, heat pumps, kerosene heaters and electric resistance heaters.

Figure 6 shows the diffusion of various kinds of space heaters and figure 7 shows the rapid growth in space heat energy in Japan.

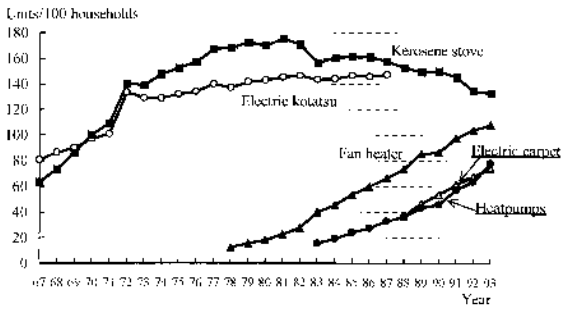
These changes are reflected in our Fukuoka sample. Over half of the sample (9 households) had a *kotatsu*, but only 3 families used it regularly. Two did not use it at all and the remaining 4 used in only occasionally, most often when friends or families visited. Eight households had an electric carpet, a more modern version of the *kotatsu*. Every household in the sample had at least one space heater, and 11 of the 16 had two or more. More than half (9) of the families heat more than one room on a winter evening.

Figure 5. *The Japanese kotatsu* body heating system



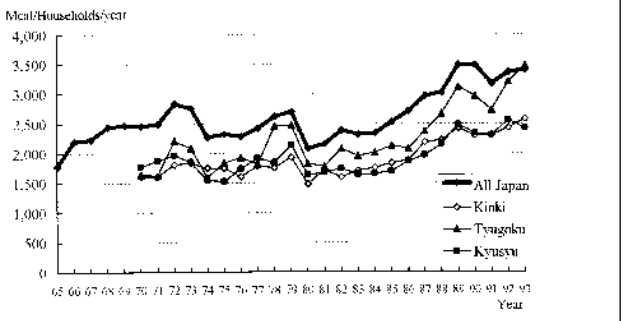
SOURCE: Wilhite et al. 1993

Figure 6. *Diffusion of space heaters in Japan*



SOURCE: Economic Planning Agency (1993)

Figure 7. *Energy consumption for space heating (weather adjusted) in Japan*



SOURCE: Residential Energy Statistics Yearbook Japan (1994)

Building Design

The results of the interviews yield some insights on the factors driving the change in space heating practices. An important factor is building design. The same changes in building design which encourage more air conditioning also encourage the use of space heating. Traditional dwellings are drafty. It makes sense to warm the person rather than to try to keep the entire interior space warm. Modern buildings are tighter, creating the opportunity to heat the space with less heat loss through the shell. The result is a warmer interior and a net increase in the amount of energy used.

Changing Work, Family Interaction and Home Use Patterns

Japanese worker's time away from home has been gradually increasing over the past 30 years. This is due to longer working hours, more socializing with colleagues after the

normal work day, and longer commuting times due to increased traffic and urban sprawl. In the Fukuoka sample, the male in the household spent on average 12.6 hours each day away from home in conjunction with work and commuting. Men are less likely to take meals with their families. More than half of the fathers in the sample did not see their children on a weekday evening.

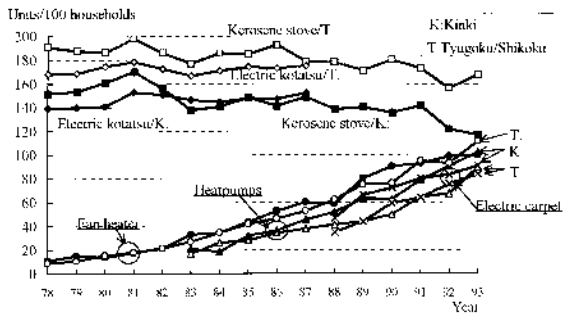
Women spent a much greater portion of the day at home than the men. Less than 50% of adult women work in Japan, and those who do work, work shorter hours. Women most often control the household budget and do the household chores. Women also do most of the practical necessities connected to child rearing.

The social interaction in the home is considerably different today than it was 40 years ago, when the *kotatsu* was a central social focus for the family. There is less opportunity for the nuclear family to assemble in the home. Where formerly the extended family tended to either share the home or live nearby, today it is less common. Guests are rarely invited to the home for meals. The mother and children in the family are more likely to be involved in individual activities like housework, study, hobbies, etc. The dinner, bath, bed routine on a winter evening is fast disappearing. These changes discourage use of person heating and encourage heating the interior space of the home.

Urban vs. Rural Variation

As with space cooling patterns, we can see differences in heating patterns in rural vs. urban areas. Figure 8 shows that the *kotatsu* is still more prevalent in the rural Tyugoku/Shikoku area than in the urban areas. At the same time, space heaters are present in roughly equal numbers, and the amount of energy which goes to space heating is actually greater in the rural area where residences are larger. It is possible that the *kotatsu* has been retained for social uses (guests and special occasions), but that space heaters now routinely provide heat to the home.

Figure 8. *Diffusion of space heaters in Kinki and Tyugoku/Shikoku*



SOURCE: Economic Planning Agency (1993)

SUSTAINABLE CONSUMPTION

A Framework

Changes in the way important energy services are used in the home can be linked to Modern (Western) material norms, economic factors, changes in work and home use patterns, and the changing symbolic meaning of the air conditioner, which in turn has been influenced by advertising. These same factors are behind other consumption-derived home services such as fashion, culinary, mobility and entertainment services. From an environmental point of view, energy services have significant environmental consequences and those consequences have increasingly been acknowledged in energy use models. Recently, there is increasing recognition of the contribution of the other consumption derived services. An effort is underway which attempts to incorporate environmental constraints into consumption models (Stern 1996). 'Sustainable consumption' is a new framework which takes into account basic needs, quality of life and environmental consequences. According to the OECD Environment Directorate, a sustainable world is likely to require:

—reduced levels of production and consumption in the industrialized world

—an absolute reduction in resource use

—simpler lifestyles while maintaining present standards of living (a better formulation might be simpler lifestyles while maintaining life quality goals) and would be accomplished through:

—greatly increased energy and materials efficiency

—a rethinking of the notion of 'quality of life' to emphasize less materialistic goals (OECD 1995:A5).

In this section we show how a framework for analyzing energy consumption and its consequences might be applied to efforts to develop a framework for sustainable consumption.

Those of us familiar with analysis of energy consumption are aware of the relationship between total energy consumption, energy service and energy efficiency. For a given energy service, such as heat, light, or motive power, the total amount of energy consumed is the product of the efficiency of the delivery of the service and the amount of the energy service

demand. Energy consumption can be reduced through either greater energy efficiency at one or more links in the delivery, or through reduction in the amount of energy service consumed. In developed countries where population growth has stabilized and consumption of energy services is high, both efficiency and per capita reduction of service levels should be the targets of policy (Noergaard and Viegand 1994).

Drawing an analogy based on this framework for analyzing energy consumption, the total amount of environmental damage associated with a household consumption service (i.e. ambiance, mobility, fashion, culinary experiences, entertainment) would be the product of the demand for the service and the environmental efficiency of delivery (delivery method A is more environmentally efficient than delivery method B if it has less environmental side effects). Examples of greater environmental efficiency would be reuse, recycling, or substitution with (more) environmentally friendly products. Greater energy efficiency and substitution with renewable energy would also be categorized as environmental efficiency. Environmental consequences would then be reduced through either greater environmental efficiency or through the reduction of problematic services.

Application to Japanese Cooling and Heating Practices

How would one address air conditioning and space heat consumption in the context of this sustainable consumption framework? First one would have to develop criteria for categorizing services according to the environmental consequences (i.e. resource depletion, pollutant emissions, climate gas emissions) and to their human uses (basic needs and life satisfaction). Services with the greatest environmental consequences and the least input to basic needs would be addressed first. Sorting consumption patterns according to this taxonomy poses an enormous challenge, both analytically and politically. We will not pursue the issue here. We contend, however, that due to their close links with environmental problems, basic needs and life quality, both air conditioning and space heating deserve attention as objects of analysis for sustainable consumption efforts.

Concerning space heat, we suggest that the basic need aspect would have to be carefully weighed. A minimum of space heat is necessary to insure health and in some cases protect life. In Japan, while heating equipment and consumption of heat is increasing dramatically, the levels are still far below other developed countries. A very warm interior has not yet become symbolically associated with affluence or modernity. Given this situation, there would be no prerogative in the short term to attempt to reduce the service level. Efforts would rather focus on environmental efficiency, which in this case would mainly consist of efforts to reduce energy-related consequences. In Japan, where 90% of the energy is generated from conventional sources, fuel switching is not particularly fruitful. Of course a focus on development of alternative heating fuels, such as solar and biofuels, is important in the long term. In the short term, improving the energy efficiency of both equipment and end-use management would be given the highest priority. Sustainable policy instruments would focus on manufacturers (standards, technology procurement, etc.), building standards, and on information to end-users on how to get the most out of their heating equipment for the minimum amount of energy input (thermostat setback is an example).

Air conditioning might get a higher priority as a target for a sustainable policy. It contributes to a number of environmental consequences. It also contributes to comfort but in most cases is not necessary for the sustenance of life. Beyond a certain level of cooling, the use of air conditioning could be classified as a luxury service. What are the sustainable policy options? In the case of environmental efficiency, again, fuel switching in Japan yields marginal environmental gains. Concerning energy efficiency, the standard air conditioner seems to be approaching a technical limit. There is some potential for increased environmental efficiency through substitution with heat pumps where possible. This substitution could be accelerated with economic instruments like tax breaks or rebates.

Limited opportunities for greater efficiency direct attention to the service variable, and to the central problem for sustainable consumption: how to limit demand for a problematic service? For the long term, an obvious goal is to attempt to reverse the direction in the evolution in building design. The tradition and know-how for buildings which exploit natural cooling still exist in Japan. They should be capitalized on in designing homes and buildings with minimum artificial cooling needs. A negative development which would have to be reversed has been the trend to mass produce building designs which are used in all parts of Japan, instead of encouraging regional design which takes local conditions into account. In the short term, information might play a role in helping people to manage their cooling loads (use shading, window sashes, plants, thermostats, turn off when not home, use natural ventilation at appropriate times of the day, etc.). Economic instruments to make air conditioning more expensive might be appropriate, but one cannot expect significant behavioral changes when alternative ways of achieving a comfortable indoor climate are limited.

In the final analysis, any effort to limit air conditioning service will run up against the symbolic role that air conditioning has assumed. One effort might be to counter the stream of media images associating air conditioning and the modern family, linking positive images with traditional building and cooling practices. But where would these

images be created and how would they be distributed? Images of consumer moderation go against the grain of 40 years of evolution of the Japanese consumer ethic and are contrary to the motives of most commercial actors. Government and NGOs would have to play a central role. In Japan, one potential participant is the Government Housing Corporation. Through their projects and extensive advertising budget, they could be a trend setter in the field.

CONCLUSION

We have shown how changes in Japanese cooling and heating practices are related to the 'Westernization' of the home, and to changes in work, family and home use patterns. This process of change in the culture of the home is immensely complex. It is next to impossible to sort out the relative importance of the change factors. It is safe to say, however, that the symbolic association of material modernity and modern lifestyle still generate a constant undertow of change in the direction of increased demand for services and away from achievement of sustainable consumption. A framework for analyzing sustainable consumption must face up to this issue. A prerequisite for the further development of a sustainable consumption framework will be a mapping of environmentally problematic services to their roots in not only consumer behavior, but also in commercial practices and government policy. To date much of the effort has been on efficiency in the form of environmental standards, labeling and recycling. Nonetheless, resource depletion, waste generation, climate gas and other emissions continue to hover on or above critical levels. If those problems are to be brought under control, the politically tougher issue of reducing demand for environmentally problematic, material-based services will have to be addressed.

ENDNOTES

1. For a more comprehensive discussion of the method and results from the ethnographic study, see Wilhite et al. 1996.

2. Practices which have deep cultural roots are more resistant to change than others. We have discussed in an earlier paper how bathing habits are changing much more slowly than air conditioning and heating habits (Wilhite et al. 1996).

3. More people are wearing suits to work today than in 1960. There was a government effort in the 1970's to encourage more casual dress. This has been renewed recently in a campaign to promote 'Casual Friday', a day in which clothing standards at work are relaxed.

4. We are grateful to Mitsubishi, which graciously provided us with hundreds of examples from the 30 year period.

5. We noted that energy efficiency has been emphasized in only two brief time periods, the first from 1976-80, after the energy price shocks, and the second in the most recent period from 1992-95.

REFERENCES

Nakagami, Hidetoshi. 1994. Kurashi no henka to enerugii: jyuutaku setsubi kiki no hensen to enerugii shouhi (Lifestyle change and energy: Household equipment and energy consumption). *Journal of the Institute of Electrical Engineering of Japan*, Special Issue: Residential environment in the near future. vol. 114(9), September.

Noergaard, J. S. and J. Viegand. 1994. *Low Electricity Europe—Sustainable Options*. European Environmental Bureau. Brussels.

OECD. 1995. Final Report of the OECD Workshop on Sustainable Consumption and Production: Clarifying the Concepts. Rosendal, Norway, 2-4 July.

Stern, Paul. 1996. Toward a Working Definition of Consumption for Environmental and Research Policy. Workshop Global Environmental Impact of Consumption in the United States. National Academy of Sciences, Washington, D. C., November 8-9.

Wilhite, Harold, Hidetoshi Nakagami, Takashi Masuda, Yukiko Yamaga and Hiroshi Haneda. 1996. A Cross Cultural Analysis of energy-use behavior in Japan and Norway. *Energy Policy*, in Press.