

# RESEARCH AND INVESTIGATION OF ENERGY CONSERVATION AND ENVIRONMENTAL AWARENESS OF URBAN AND RURAL RESIDENTS IN DALIAN

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## 0 Introduction

Due to the acute shortage of the earth's energy, the responsibilities and obligations of citizens force to protect environment and save resources. In order to further understand the daily habits of urban and rural residents and energy conservation environmental consciousness, and grasp general level of the environmental consciousness, Dalian University of Technology and Kyushu university jointly carry out the international cooperation project\_ research project on "the Development and the Mechanism of Low-Carbon Society in Asian Major Cities", from September 2009 to February 2010, focusing on questionnaire survey about the energy saving and environmental consciousness of urban and rural residents, and field survey about energy consumption and approaches of saving building energy in design in Dalian has been made in China, Japan, Korea, Vietnam, Thailand, Indonesia, and other countries participate in the international cooperation project, choosing Dalian and Chongqing as subjects of China.

## 1 Outline of questionnaire and field survey

### 1.1 Method and Respondents of Questionnaire

In order to make the investigation object region cover center area of Dalian city, surrounding towns and the country far away from the city, meanwhile reflect the different of social class, the education level and age, Respondents from the two middle schools located in center area of Dalian city and one middle school located in town, at which students come from town, has been chosen. In the investigation process, the survey has been supported by the three middle school, Distributing numbers and Effective numbers of respondents questionnaire are shown in table 1.

### 1.2 Content of questionnaire

Five kinds of questionnaire are designed for this survey, which is respectively for urban parents, urban students, rural parents, rural students and rural grandparents. For residents of city, contents of questionnaire including 7 categories, 48 issues involving personal information, environmental consciousness and way of life, consumption behavior (electrical home appliances and cars), living environment, waste treatment and residential construction, and so on; For residents of town, except issues for residents of city, the survey also includes the agricultural production, traditional heating means, etc.

Tab. 1: Questionnaire summary

Survey area	Survey period	Subjects for distribution	Distributing numbers				Effective numbers of respondents
			For parents	For students	For grandparents	Total	
City	Sep.27-	high school	1704	1704	0	3408	3182
Rural	Oct. 12,2009	high school	912	912	27	1851	1650

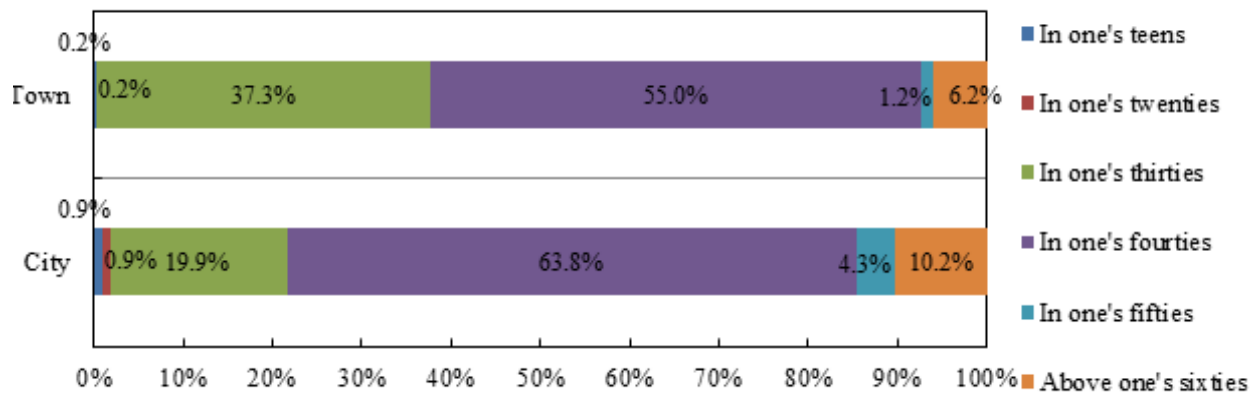


Fig. 1: Age structure of respondents

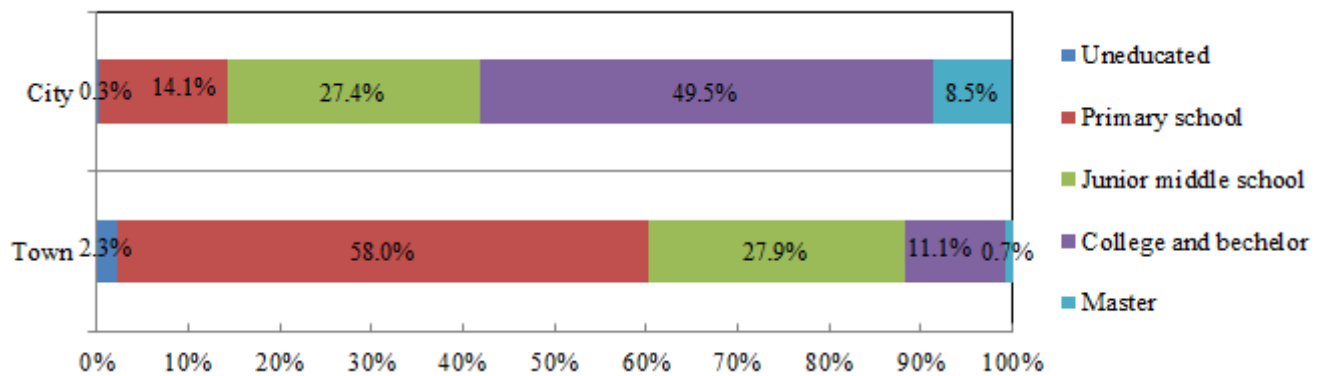


Fig. 2: Culture structure of respondents

## 2 Results of questionnaire survey on energy use and environment consciousness

### 2.1 Constitute structure of Respondents

Constitute structure of Respondents is as shown in Fig.1~ Fig.3. Approximately the same number of people is surveyed in the city and rural area. There exists a significant difference in the educational levels of the respondents in the city and rural area. Proportions of urban parents that have attained higher education is close to 50%, yet rural parents that attained higher education only accounts for 11.1%. In effective questionnaires, 55% of the respondents are between the age of 40 and 50.



Fig.3: Distribution of respondents

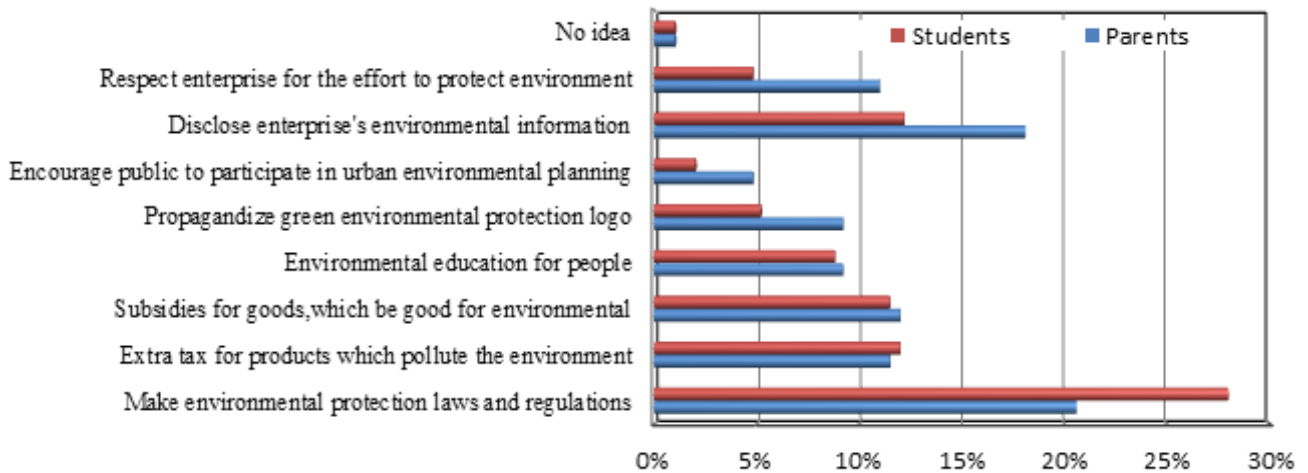


Fig.4: Results of measures that can reduce the greenhouse effect people think

Fig.4 shows the survey results of which kind of the measures people think can reduce the greenhouse effect. It is known from Fig.4 that the most important measure of protecting the environment is to lay down the laws and regulations about environmental protection; Secondly important measure is to request the enterprise to disclose their environmental information in order to well inform the public of the enterprise's pollution to the environment; Other measures such as collecting environmental tax for Energy-intensive products, giving the government subsidies for green products, and Environmental education for people also gain acceptance, yet encouraging the public to participate in the planning of urban environment is not a good way, which has low expectations.

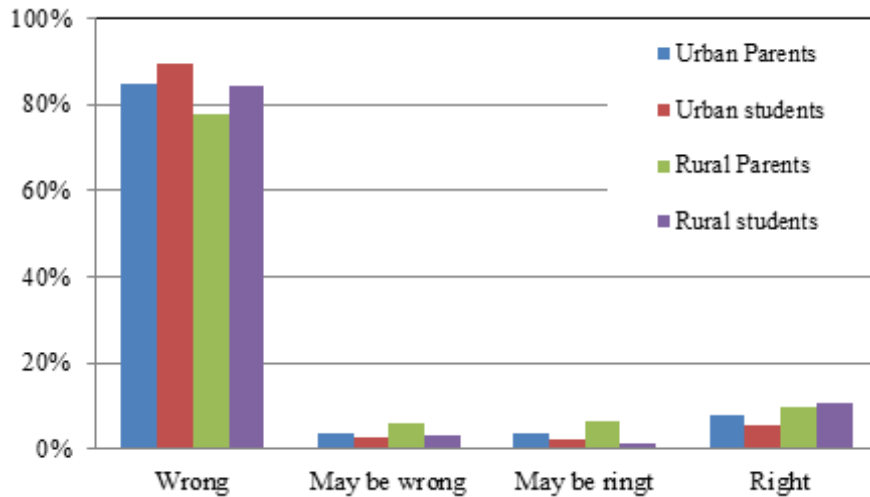


Fig. 5; Results of 'with air conditioning, warming of the earth affect the living very much'

The questionnaire survey has one issue that "even if the earth is constantly warming, as long as there is air conditioning, that will not a big impact on human life, choose their own opinion,". Fig.5 shows the statistical results can be seen only less than 10% of people think the earth warming do not have relations with their own life.

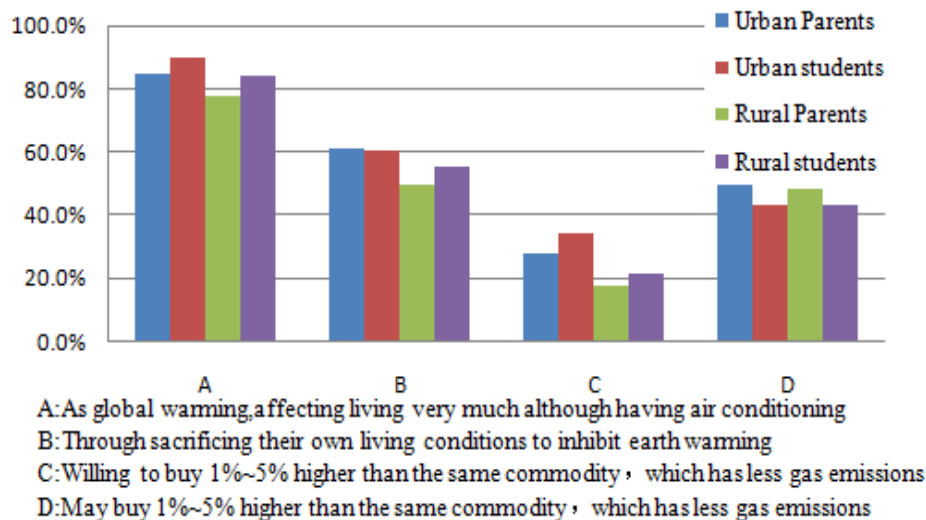


Fig. 6; Attitude to face global warming

Fig.6 shows the statistical results of people's basic attitude to face global warming. More than 50% of urban and rural residents are willing to sacrifice their own living conditions to inhibit earth warming. People environmental consciousness enhancement also reflects from the attitudes for the waste, 65% of people think the waste treatment way now is not reasonable, 88% of the people support garbage processing mode for environment friendly. For some common high pollution living garbage, such as waste electrical appliance, battery, people want to related departments to enforce unified recycling and reuse.

### 2.3 Save-energy consciousness and living behaviors

According to statistics, 60% of family in Dalian has air conditioning, 99% of the family have a TV, 40% of the family has a car. In addition, through this investigation way of life including many energy saving habits are found, for example, 90% of the investigators will turn off lights when leaving; 56% of households can sit together to watch one television; When using air conditioning, 67% of families can close air conditioning before ten minutes when they go out, and so on. But less than 10% of people come to realize some energy saving

behaviors, for example, ahead of cooking rice, immerse rice 10 minutes to achieve saving electricity; considering purchasing (LB) commodities having green environmental protection mark(LB); don't buy frozen food or cooking at home, and so on.

Statistical results show that in life women has higher energy saving consciousness, 90% of the female investigators can notice some tiny save-energy behavior, and for men, the number was only 65%. The female investigators has high accept ability in the new energy saving consciousness, for a few now energy saving consciousness in the survey, 54% of the female investigators expect to practise, so the gender in this effects must be paid attention to in the propaganda on energy saving consciousness.

In the investigation, 89% of investigators which have highly educated can positively practise lifestyle of good energy saving, and 84% of investigators which do not have highly educated also try to actively practice these lifestyle. So the impact of the degree of education on accepting energy saving consciousness and is not big.

#### 2.4 Heating means and living environment

When residents buy houses, they not only consider the size of the house, but also taken account other factors include the residential environment and health, culture atmosphere, ecological environment, public facilities level, and etc. Heating of Dalian is mostly through district heating, but there are many different heating means for rural area. According to middle school student's survey of the town, other than district heating, a large percentage of families use the Kang and common stove for heating, as shown in Fig.7 below. The main fuel for heating is coal, accounted for 42%; and the proportion of biomass energy is only 32%, the results of the survey shown as Fig.8.

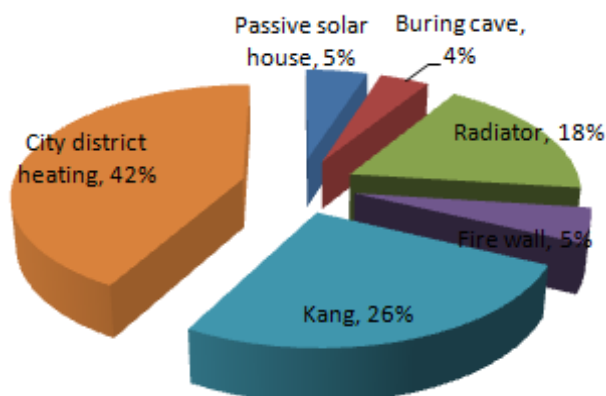


Fig. 7: Results of means of heating in town

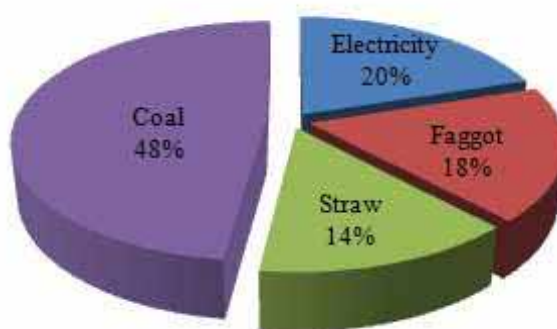


Fig. 8: Energy utilization structure for heating

Survey results of comfort of indoor environment are shown as Fig.9 and Fig.10. According to the investigation results, summer indoor environment in rural residence is slightly better than that of the urban residence. Although the summer outdoor temperature in Dalian is not very hot and the item period of using air

conditioning is very short, 60% respondents believe they have poor ventilation. This problem may be as a result of building's architectural design. In winter, the urban family thinks the indoor environment is too dry, and the proportion room temperature fail to reach satisfactory level is clearly higher than that of rural ones. In winter, the urban family think indoor environment dry, and the proportion of that room temperature can't reach requirements clearly higher than that of rural ones. That's because of different heating means and thermal comfort. For indoor overheat, the proportion of often open a window or occasionally to cool in urban and rural residents are both high.

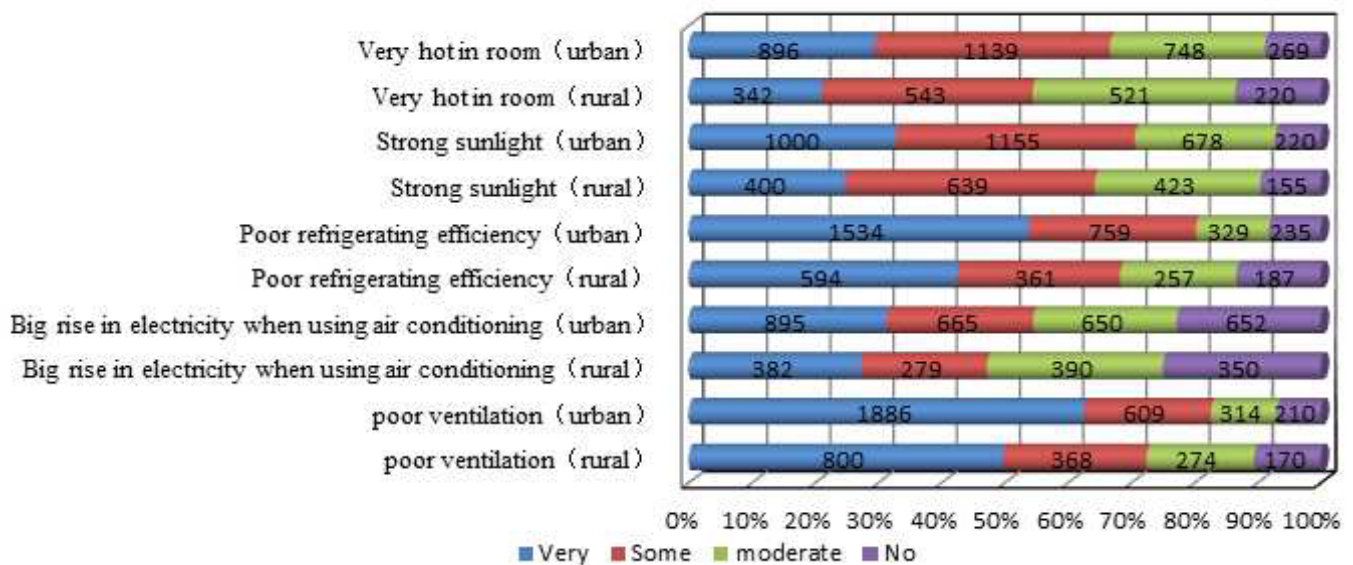


Fig. 9:Results of indoor environment in summer

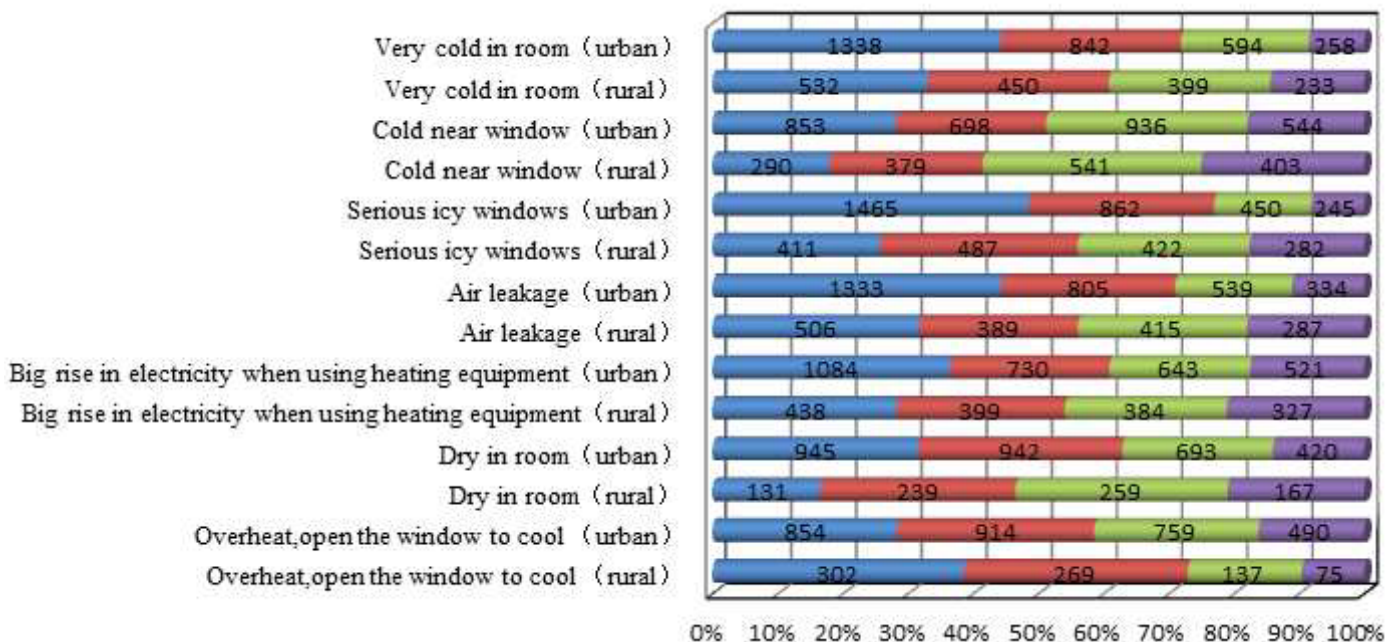


Fig. 10:Results of indoor environment in winter

### 2.5 Utilization of natural energy

In the investigation 40% of the family actively considers some solar energy application technologies when their income increases. So the utilization of natural resources increases rapidly, yet led to electrical equipment use

surge and caused the rapid increasing energy consumption. Although the power demand is growing, the solar water heater as the only by using renewable energy common equipment, through the investigation 68% of the urban family have been installed, and in rural areas, 32% of family do it. The utilization of renewable resource relatively reduced the utilization of non-renewable resource, that plays an important significance in saving energy to protect the environment.

### **3 The seminar**

On February 24, 2010, The experts, scholars and government officials from China, Japan, Korea, Vietnam, Thailand and Indonesia and other countries participated in the international seminar " Frame of low-carbon society " in Fukuoka, Japan. Seminar participants based on the survey data of all countries widely exchange their views. Chinese representatives are from Dalian University of technology, Dalian Environmental Protection Bureau, Chongqing University and Chongqing's Rural Energy Office, and other units. Subjects is discussed around low carbon society , related policies and regulations of each country, energy-saving and eco- awareness for urban and rural residents, construction of demonstration project. Etc. This seminar enhances exchanging ideas about frame of low-carbon society for the Asian countries regions.

### **4 Conclusions**

During the investigation, residents' eco-awareness and energy saving consciousness in the city and town has improved significantly. There is no big difference in respondents with different economic status, educational level, or district, showing a high degree of overall awareness of the environment protection and energy saving. The survey and study lead to the following conclusions:

(1)The government play an indispensable role in environmental protection and energy saving. 20% ~ 30% of the people want to related department to formulate more practical policies and regulations. Although now energy saving and emission reduction has proceeded , but energy conservation environmental protection policy for the masses can't effectively and timely implemented. Part of the masses put high expectation to the government. And in view of less than 5% of people to participate in urban planning expectations, which is not high, this needs related department can protect the urban environment, based on environmental consciousness of masses. Only grasping the actual environment problems and that is willing be solved in the present stage, can long-term sustainable development policies be developed, which can play an important role.

(2) Improve the heating mode, use new energy actively and apply adaptive comfort to calculate its architectural design. Now half of the heating energy is provided mainly by consumption of fossil in Dalian. Over-reliance on natural resources is not suitable for sustainable development. Geographical differences and different standards of living also make it different requirements for comfort. There is a lot of unnecessary energy consumption in real life. Some people will not meet below this temperature, but this waste for energy is obvious.

(3) Strengthen grassroots energy saving promotion. Energy saving among the masses has already had a good foundation. But advocacy work for the masses determine the implementation of energy saving in the process of energy saving and environmental protection. Although people have a good sense for energy, 95% of living habits under the investigation can't do everything in energy requirements. Therefore, energy-saving habits require extensive propaganda. For example, wash rice and soak it ten minutes before cooking in order to achieve energy saving, purchase goods refer to green flag, do not buy frozen foods or eating out, etc.

(4) Survey shows that most residents have interest-driven environmentally friendly behavior. They have initiative and enthusiasm only when the energy saving associates with the behavior of their own interests. Under the circumstances, the families for environment protection and energy saving should be given appropriate financial compensation by the relevant departments. Financial compensation can increase the purchase of products related to energy saving by 20%. Economic factors in the energy saving accounts for a significant proportion. There are more middle income families in China and they are the most important energy saving people. However, they deviate from their own will to buy cheaper energy-consuming products due to the economic, service and other factors. Some financial compensation can play a significant role to help about 40%

of users that likely to purchase energy-saving products to buy energy-saving products.